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**DEPARTMENT OF DEFENSE ENERGY  
POSTURE**

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HEARING

BEFORE THE

READINESS SUBCOMMITTEE

OF THE

**COMMITTEE ON ARMED SERVICES  
HOUSE OF REPRESENTATIVES**

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

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HEARING HELD

MARCH 13, 2008



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## DEPARTMENT OF DEFENSE ENERGY POSTURE

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HOUSE OF REPRESENTATIVES,  
COMMITTEE ON ARMED SERVICES,  
READINESS SUBCOMMITTEE,  
*Washington, DC, Thursday, March 13, 2008.*

The subcommittee met, pursuant to call, at 10:34 a.m., in room 2118, Rayburn House Office Building, Hon. Solomon Ortiz (chairman of the subcommittee) presiding.

### **OPENING STATEMENT OF HON. SOLOMON P. ORTIZ, A REPRESENTATIVE FROM TEXAS, CHAIRMAN, READINESS SUBCOMMITTEE**

Mr. ORTIZ. I understand that we might be having a vote in about 25 minutes, but we will see if we can move forward, but thank you so much for being with us today. I want to thank our distinguished witnesses. We will have a few minutes, but maybe I can get through with my opening statement.

I thank our distinguished witnesses for appearing before this subcommittee today to discuss energy use and management at military installations and for military operations.

Energy issues cut across all Department of Defense (DOD) organizations and functions. Managing the demand for energy is vital not only at facilities but also for fleet vehicles, surface ships and submarines, aircraft, and tactical vehicles. The Department is developing innovative energy sources for soldier power and for forward-deployed locations, while also striving to find sources of renewable energy and meet goals for energy efficiency on installations at home.

Management is vital because the Department of Defense spends billions of dollars every year on energy. The Department's request for 2009 includes \$3 billion more for energy than last fiscal year. This week, the price of oil topped \$109 per barrel and is four times more expensive than it was in 2001. Increased fuel prices strain the military services' readiness accounts. For example, in fiscal year 2009, roughly half of the increase in the Navy's operations and maintenance budget request is due to projected increases in fuel costs.

For the past several years, the Defense Energy Supply Center raised bulk fuel rates mid-year, charging the services more than they budgeted for fuel. In many ways, the Department has already assumed a leadership role in addressing energy demand challenges. For example, even before the National Defense Authorization Act for fiscal year 2007 required it, the Department of Defense already had established an internal goal of using 25 percent renewable electricity by 2025.

The services are also implementing innovative energy projects. For example, at Nellis Air Force Base, the Air Force has partnered with private industry to build the largest solar panel array in the Americas. This was accomplished through an enhanced use lease which allows the installation to lease non-excess land to private entities for 50 years or more. Other plans for the use of enhanced use leases raise questions, however.

The Air Force is proposing enhanced use lease agreements for a coal-to-liquid production facility at Malmstrom Air Force Base and for nuclear power plants on other Air Force installations. I am concerned that use of such long-term commitments may impede a base's primary mission and could result in another form of encroachment. I will be very interested to hear whether the Department thinks these proposals serve the overall good for installations.

I also hope to address the criteria we use to evaluate choices that affect energy use. For example, what lessons are being learned from the pilot study using the fully burdened cost of fuel for mobility systems? Of course, we also are anxious to learn about recommendations by the Defense Science Board (DSB) and Government Accountability Office (GAO), as well as specific energy solutions and challenges from the Department's perspective.

I look forward to thoughtful testimony from the distinguished witnesses we have invited here today on these and other issues of interest to my colleagues on the subcommittee.

The chair now recognizes my good friend, the distinguished gentleman from Virginia, Mr. Forbes, for any remarks he would like to make.

[The prepared statement of Mr. Ortiz can be found in the Appendix on page 35.]

**STATEMENT OF HON. J. RANDY FORBES, A REPRESENTATIVE FROM VIRGINIA, RANKING MEMBER, READINESS SUBCOMMITTEE**

Mr. FORBES. Mr. Chairman, I first want to applaud your leadership and foresight in addressing not only the issues that are impacting military readiness today, but also issues that a long-term threats to the readiness of the Department of Defense.

Today's hearing on DOD's energy posture and the hearing we had this past Tuesday on inherently governmental functions addressed issues that are complex and very often ill-defined. They require a long-range strategy and commitment if we are to have an impact, yet they truly are issues that define and underpin the readiness posture of the Department.

Mr. Chairman, I want to thank you for your vision and thank you for holding this hearing. I would also like to thank you for assembling this absolutely terrific panel of witnesses. Gentlemen, we thank you for taking time today to talk with us and allow us to pick your brains and get some vision and direction on this very important issue. We certainly appreciate your expertise on this matter and we value your time.

Today, we have an opportunity to look at a wide variety of issues related to the energy requirements and the energy posture of the Department of Defense. The recently released Defense Science Board study on DOD's energy strategy provides a solid backdrop

for our conversation. The findings and recommendations in this report are important and timely.

As the chairman mentioned, with the rising price of crude oil, one might even argue that they are overdue. We are honored to have one of the study's co-chairmen with us today, General Michael Carns. General, we thank you for your work on this matter, and all the members of the task force for the work you have done in examining the Department's energy challenges.

One of the goals of the hearing today is to discuss the two serious energy risk areas that are identified in your report: energy risk to our operational forces and the risk of extended loss of power at fixed installations. As you proceed with your testimony, I would ask each of you to also address what you believe needs to be done so that we can actually see real benefit from the study.

I say that because we study and report on things all the time, yet it is very difficult for us as a Congress to bring about real change sometimes. Mr. Solis, you probably understand this point better than any of us, and I know the committee has kept you very busy, and we just certainly appreciate all of your efforts and your energy and all that you do to support Congress.

I make this point because we cannot afford to have what I believe are very salient and very plausible recommendations to be put on a shelf and forgotten. I would like to know what needs to be done to bring your commendations to fruition so that we can take steps necessary to further strengthen DOD's energy posture and therefore strengthen our national defense. I am very interested in understanding how the DSB study will inform the strategic plans of the Department and how such strategic plan will be developed and implemented.

I would also like to ask that you let us know if there are legislative changes that are needed to improve DOD's energy posture. Oftentimes, energy legislation such as the Energy Independence and Security Act of 2007 is written with a broad focus across the government. While I agree that the U.S. Government's energy policy should be just that—government-wide—the Department of Defense has unique mission sets, a unique structure, and unique operating requirements. We must take care to ensure that legislation that has all the best intentions does not have unintended consequences that unduly degrade military capability.

Once again, thank you for joining us today. I look forward to your testimony and to gaining a better understanding of what we need to do to ensure military readiness through a strong energy posture.

Mr. Chairman, thank you and I yield back the balance of my time.

[The prepared statement of Mr. Forbes can be found in the Appendix on page 43.]

Mr. ORTIZ. I checked with the minority, and request unanimous consent to allow my good friend, Mr. Bartlett, to also have an opening statement.

**STATEMENT OF HON. ROSCOE G. BARTLETT, A REPRESENTATIVE FROM MARYLAND, COMMITTEE ON ARMED SERVICES**

Mr. BARTLETT. Thank you very much, Chairman Ortiz, for allowing me to sit in on this subcommittee hearing. I welcome this hearing for bringing attention to the new Defense Science Board report on Department of Defense Energy Strategy: “More Fight—Less Fuel.”

I believe that energy is the most important challenge facing the world and our country in the 21st century. Specifically, I am most concerned about the imminent prospect of global peak oil. Global peak oil is inevitable because each oil well peaks and then declines in production after it has produced about half of its reserves. Similarly, regions and countries peak. U.S. oil production peaked in 1970.

My colleagues on the Energy and Environment Subcommittee of the Science Committee and I received testimony from Dr. Bob Hirsch in a field hearing held in Houston on February 29. Dr. Hirsch said “The Royal Swedish Academy tells us that 54 of the 65 most important oil producing countries are already past their peak production.”

A 2007 GAO report that I commissioned warned that the U.S. is particularly at risk for negative consequences from peak oil. That is because we are the world’s biggest user of oil, consuming 25 percent, while producing only 8 percent of world production from just 2 percent of world reserves. Recently, chief executives from the Hess, ConocoPhillips, and Shell oil companies all expressed doubts about the ability for world oil supplies to meet demand by 2015, a very short time for DOD planning horizons.

Oil is over \$100 a barrel and Goldman Sachs is among those estimating it could go to \$150 or \$200 a barrel this year. We are acutely aware as members of the Armed Services Committee that the Defense Department is the largest consumer of oil in the country. We know that mobility platforms consume the most energy used by the Department, with jet fuel representing nearly 60 percent of fuel consumed by DOD.

I am really proud of the Defense Department for its national leadership role in energy efficiency, advanced energy technologies, and utilizing renewable energy. The military trains like it fights. The military needs to plan like it fights. A 2001 Defense Science Board report recommended that it is imperative to reduce vulnerability and increase warfighting capabilities by achieving greater energy efficiency and less energy intensity of operational forces and weapons platforms.

It is common sense that if you don’t measure it, you can’t manage it. That, in essence, was the hub of the challenge concerning energy from the Defense Department when the 2001 Defense Science Board report was issued. Some may perceive that this new DSB report represents *deja vu*. However, it is not. There have been at least two key steps that were already underway prior to the release of this new DSB report.

In August of 2006, the Vice Chairman of the Joint Chiefs of Staff issued a memorandum endorsing a Joint Requirements Oversight Council decision to establish an energy efficiency key performance parameter (KPP). This KPP was subsequently required by the



chairman of the Joint Chiefs of Staff's instruction, CSI-3170(f) dated May 2007. In April of 2007, an under secretary of defense acquisition, logistics, and technology (AT&L) memorandum established that it is Department policy to use the fully-burdened cost of fuel for all acquisition trade analyses.

I am looking forward to today's witnesses addressing the Defense Science Board's first recommendation for the Department to accelerate efforts to implement energy efficiency key performance parameters and to use a fully-burdened cost of fuel to inform all acquisition trades and analyses about their energy consequences. Seventy percent of the tonnage delivered to deployed forces is fuel. Fuel delivery convoys to deployed forces add costs to the logistical chain and create targets for improvised explosive devices (IEDs), the single greatest source of casualties in Iraq.

Additional personnel protection measures to reduce casualties from IEDs, such as air cover or air transport substitutions for ground convoys increases costs further. I look forward to learning from our witnesses your perspective about energy management by the Defense Department.

Thank you very much, Mr. Chairman.

Mr. ORTIZ. Today, we have a panel of distinguished witnesses representing the Department of Defense, the Defense Science Board, and the Government Accountability Office. We have with us Mr. Wayne Army, Deputy Under Secretary of Defense for Installations and Environment. Wayne, welcome.

We have Mr. Chris DiPetto, Deputy Director of Systems and Software Engineering in the Office of the Under Secretary of Defense for Acquisition and Technology. Welcome, sir.

And we have General Michael P.C. Carns, United States Air Force, retired, Chairman of the Defense Science Board Task Force on Energy Strategy. General, thank you, sir.

And we have Mr. William Solis, a good friend. Good to see you again, sir. He is Director of Defense Capabilities and Management, United States Government Accountability Office.

Without objection, the witnesses' prepared statements will be accepted for the record.

Mr. Army, welcome. You can proceed with your opening statement, sir.

**STATEMENT OF WAYNE ARMY, DEPUTY UNDER SECRETARY OF DEFENSE, INSTALLATIONS AND ENVIRONMENT, DEPARTMENT OF DEFENSE**

Mr. ARMY. Thank you, sir.

Chairman Ortiz, Congressman Forbes, distinguished members of the subcommittee, I appreciate this opportunity to appear before you to discuss the Department's installation energy efficiency and conservation posture. As we mentioned before, installations are a critical component of our defense capabilities and directly affect our training, readiness, and quality of life.

Besides maintaining that quality of our facilities, we believe it is imperative for the Department to exercise good stewardship of the natural resources, not only because of the environmental impact, but also because there is a sound business case for maximizing the expenditures of our resources.

There are two speakers here today representing DOD. I will be speaking in the installation aspects of energy and non-tactical vehicles, and Mr. Chris DiPetto from Director, Defense Research and Engineering (DDR&E), will focus on mobility. After our presentations, I hope you will have a better understanding of our different roles.

As the deputy for installations and environment, I have responsibility for the Department's installation and non-tactical vehicle energy consumptions. This represents almost 28 percent of the total energy consumed by the Department, and of that, only 1.5 percent is for non-tactical.

I am happy to report that for fiscal year 2007, facilities energy utilization decreased by 10.1 percent on a British Thermal Unit (BTU)-per-square-foot basis from the 2003 baseline, with a cost savings of \$80 million, despite the rising cost of energy. Our installation energy effort is guided by the Energy Policy Act of 2005 and the Executive Order 13423. These policies direct the agencies to take action in a wide variety of functional management areas.

Further, the recently passed Energy Independence and Security Act of 2007 also contains a number of new requirements, as you mentioned, and we are examining them for implementation. We will get back to you on the questions you asked on that.

In January 2006, the Department also joined 16 other federal agencies in signing a memorandum of understanding (MOU) for federal leadership in high-performance and sustainable buildings. We are pursuing the attainment of Leadership in Energy and Environmental Design (LEED) silver-gold for 70 percent of the fiscal year 2009 military construction projects. In addition, we are working to address the sustainability of existing facilities.

Aside from construction of new facilities, we continue to invest in initiatives to approve efficiency in existing structures through the use of the energy savings performance contract that you also renewed a couple of years ago, and utility energy service contracts. These enable us to bring in more cost-effective long-term facility operations and maintenance with no up-front costs. The work, and typically account for more than half of all of our facility energy savings. They are paid for through energy savings. By 2005, we had reduced facility energy use by 28.3 percent from the 1985 baseline.

We have also increased our focus on purchasing renewable energy and developing renewable resources on our installations. As you recall, we have special legislation that allows us to do that. We have also increased the use of energy conservation investment program funding for renewable projects from \$5 million in fiscal year 2003 to \$28.2 million planned for fiscal year 2008. We intend to increase funding for these projects to \$10 million per year up to \$120 million in fiscal year 2013.

In geothermal, for which I said we had legislation, we are making tremendous progress. We are also working with the Office of Management and Budget (OMB) to expand this legislation so that we can exploit other forms of traditional and renewable energy on our facilities. For the geothermal as of now, we have a 270 megawatt power plant at China Lake that supplies enough energy to serve 180,000 homes annually, and the base gets a reduction in its own energy bill.

We have a second power plant under construction in Fallon and three additional plants in the southwest are planned at El Centro, 29 Palms, at Chocolate Mountains, and at the Army ammo depot at—I draw a blank right now. The Navy is also working with the Army to do geothermal exploration there.

We also have multiple solar facilities online, and initiatives at several locations, including California, Texas, and Arizona. The Air Force recently brought on North America's largest solar array at Nellis. That produces 14 megawatts and provides one-third of the base's electric requirement. That, again, was done with no money up front on the part of the Air Force and will provide significantly lower electric rates over time.

We are also pushing into ocean and tidal wave technology, and we are working to set up small wind farms with diesel backups wherever they make sense, especially at remote locations. We have these at San Clemente, Guantanamo Bay and on the islands powering radar off of Point Mugu.

One that is very interesting, we funded a small business innovative research project for an ocean thermal energy conversion program. OTEP as it is called is being tested on Diego Garcia. The project seeks to use the temperature differences between the ocean surface and deeper water to produce electricity and potable water to a location where we all know both those commodities are very expensive to produce.

I will briefly mention non-tactical vehicles. The Department is required by legislation to use alternative and flexible fueled vehicles for at least 75 percent of new vehicles in metropolitan service areas, and we meet that goal. But unfortunately, we have not seen the development of the alternative fuel infrastructure that we need to fuel those vehicles. So consequently, while we have the number of vehicles, they are still using regular fuel to power because we don't have access to the alternative fuels.

We are investigating ways to help do that, as you have seen at our Quarters K gas station up by the Pentagon, open to the public, our alternative fuel facilities. We are working with other exchanges.

In closing, I thank you for the opportunity to highlight the Department's energy management of our installations and non-tactical vehicle fleet, and to talk about our successes and our plans for the future. Your support of the Department's energy initiatives and investments is greatly appreciated, and I look forward to continuing to work with this committee as we increase energy security and reduce operating costs for the Department.

Thank you.

[The prepared statement of Mr. Arny can be found in the Appendix on page 48.]

Mr. ORTIZ. Mr. DiPetto, whenever you are ready, sir.

**STATEMENT OF CHRIS DIPETTO, DEPUTY DIRECTOR, SYSTEMS AND SOFTWARE ENGINEERING (DEVELOPMENTAL TEST & EVALUATION), OFFICE OF THE UNDER SECRETARY OF DEFENSE (ACQUISITION AND TECHNOLOGY)**

Mr. DiPETTO. Thank you.

Chairman Ortiz, Congressman Forbes, distinguished members of the subcommittee, thank you for the opportunity to appear here before you today to discuss the Department of Defense's current efforts to address our energy risks and our energy governance. The past year has been quite active as the enterprise has begun to appreciate the challenges and potential opportunities related to energy.

My name is Chris DiPetto and I am here representing the Deputy Under Secretary of Defense for Acquisition and Technology (A&T), Dr. James Finley. A&T has some specific responsibilities related to examining and setting policy on DOD mobile systems energy. Specifically, we were directed by the deputy secretary to mature and incorporate a concept called "the fully burdened cost of fuel" into DOD business processes.

Incorporating this concept, we believe, will give energy, particularly the burdens of battle space-delivered fuel, proper consideration as design, develop and acquire capabilities. The DOD Energy Security Task Force is chaired by Under Secretary of Defense for Acquisition, Technology, and Logistics, the Honorable John Young. This task force was chartered in May, 2006, to delve into the unique energy challenges the Department faces and to develop management and technology solutions.

This group has succeeded in raising the profile of energy within the Department and is positioned to provide senior leadership with actionable recommendations this year on how to manage these energy risks in new and innovative ways. The Office of the Director of Defense Research and Engineering provides the day-to-day leadership to the Energy Security Task Force, so I would defer to them to provide the committee a broader description of the work plan and their successes to date.

However, my organization, A&T, acquisition and technology, participates actively in this group, along with other Office of the Secretary of Defense (OSD), joint staff, service and defense agency representatives. I hope to provide you with some context on the energy challenges the Department faces. Information on the work my leadership and I are doing to better understand the Department's energy risks, and to explain some of the planning and business process changes the Department is considering to better manage these risks.

I provided my formal testimony for the record. So with that, I thank the subcommittee for their attention on this cross-cutting issue and I will welcome your questions.

[The prepared statement of Mr. DiPetto can be found in the Appendix on page 43.]

Mr. ORTIZ. Thank you, sir.  
General Carns.

**STATEMENT OF GEN. MICHAEL P.C. CARNS, USAF (RET.),  
CHAIRMAN, DEFENSE SCIENCE BOARD TASK FORCE ON EN-  
ERGY STRATEGY**

General CARNS. Thank you, Chairman Ortiz, Ranking Member Forbes, and other distinguished members.

In May, 2006, the Under Secretary of Defense for Acquisition, Logistics and Technology commissioned the Defense Science Board

Task Force on DOD Energy Security. Citing the specific energy security risks to both our Nation and to our military forces, he challenged the task force to find opportunities to reduce DOD's energy demand, to identify institutional obstacles to their implementation, and assess their potential commercial and security benefits to the Nation.

The task force was co-chaired by Dr. James Schlesinger and myself. It included 77 members. We held 37 meetings, took 143 briefings, took 10 months to deliberate, and another 10 months to finalize our report. We came to an agreement about the most important energy tasks facing the Department, and a set of recommendations that if followed would allow the Department to manage those risks.

Here is a copy of the report which I submit for the record, and I have also provided written testimony for the record.

[The information referred to is retained in the committee files and can be viewed upon request.]

General CARNS. The Department of Defense is the single largest consumer of energy in the United States, using less than 1 percent of the Nation's total energy consumption and about 1.5 percent of its oil consumption. Interestingly enough, the number two user is Wal-Mart. Buildings and facilities use about one-quarter of DOD's total energy, and mobile systems consume about three-quarters. To put this in perspective, the Department uses somewhat more petroleum per year than a major international airline, not twice as much, but almost as much.

We found that the Department faces two serious energy risks. One is moving fuel to our operational forces, and the other is the potential for an extended loss of commercial power to certain selected critical missions at our fixed installations.

Now, a few thoughts about the risk to operational forces. Moving fuel to the deployed forces is difficult, expensive and certainly dangerous. Logistics is a vulnerable soft underbelly for us and a rich target for our enemies. The larger our logistics tail gets, the more difficult it is to protect, and as we have learned in the Iraqi conflict, more combat power gets diverted from combat operations to assure the logistics safety, the more casualties we take because of our supply trucks can never be as survivable as our combat vehicles. As Congressman Bartlett noted, both Iraq and Afghanistan have taught us that we are no longer moving logistics around in secure areas. Everything is at risk all the time.

The task force identified the best way to reduce energy tasks to operational forces is to reduce the fuel demand. The best approach to doing so was developed by the Defense Science Board 2001, and I point out that Admiral Truly is present with us and he chaired that board in 2001. In my view, the first thing to do is to educate the leadership, incorporate fuel logistics and convoy protection into war games, the scenarios, the vignettes and the campaign analyses that DOD uses to identify needed capabilities, and to develop options for fielding these capabilities. Improved endurance—the amount of capability we extract from each unit of energy an operational system uses is an important capability.

Second, we need to put a lot more rigor in the system. As was mentioned, this matter of establishing a key performance parameter for all new systems that create a demand for fuel. The results

of the war games and the scenarios and other campaign models will provide the basis for formulating those KPPs.

Again, a parenthetical note, several years ago, many of us participated in a war game up at Carlyle Barracks. During the course of that game, it actually came to a halt. That is, we were unable to execute the forces because they could not sustain the logistics trail in this particular exercise. At the time, the senior people were very critical of the control group for allowing the game to stop, saying they would be unable to fulfill their expectations of the game. We said: You just learned the most important lesson that this game can teach you.

Back to the text here, my third comment would be to find ways to value fuel and incentivize innovation. Establishing the fully-burdened cost of fuel to capture costs of moving and protecting fuel, and using that value as the financial basis for investing in new technologies throughout the stages of acquisition and re-set programs is a good start.

It also should be used for AoAs, or analysis of alternative studies, that are used to select among competing alternatives for new programs. The result of the war games, the scenarios, and other campaign models will also allow a more accurate estimate of the fully-burdened cost of fuel. "Black" programs must not be exempt from these requirements.

To give you some perspective, by the time a gallon of fuel flows out of the boom of an airborne tanker, years ago the analysis showed the Air Force had spent at least \$42 per gallon. I am sure that cost is considerably higher today, given the cost of operating systems as well as the basic cost of fuel. The task force also looked at current operational procedures that waste energy and financial practices that incentivize waste, and have made recommendations for operational changes and new financial incentives to reduce energy waste.

Now, a few thoughts about risk to critical missions. There are critical missions at fixed installations at absolutely unacceptable risk of extended outage from loss of commercial power. If the committee is interested at a later time, we would be delighted to talk about that information which is contained in a classified annex. Neither the grid nor on-base backup power provides sufficient reliability to ensure continuity of critical national priority functions and oversight of strategic missions. We base this on a series of briefings and discussions we held with the Department of Energy, industry, and Department of Defense officials, as well as reports and other literature.

While DOD has conducted vulnerability analysis and assessments of its installations, it has not yet developed an overall risk management strategy to manage those vulnerabilities. The task force has recommended that the Department form a cross-functional team to assess the risk of specific missions at specific locations. The task force also recommended the Department develop a plan as a management tool to achieve the business process changes we recommended by establishing measurable goals and clear responsibility, and most importantly, accountability.

We also recommended the Department invest in energy technologies to a level commensurate to their value to the Department.

This includes operational, as well as financial value. And finally, we recommended the DOD evaluate its operational procedures for energy waste and make appropriate changes.

Mr. Chairman, this concludes my abbreviated remarks. Thank you.

[The prepared statement of General Carns can be found in the Appendix on page 72.]

Mr. ORTIZ. Thank you, general,  
Mr. Solis.

**STATEMENT OF WILLIAM M. SOLIS, DIRECTOR, DEFENSE CAPABILITIES AND MANAGEMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE**

Mr. SOLIS. Chairman Ortiz, Ranking Member Forbes, members of the subcommittee, I appreciate the opportunity to be here today to discuss DOD's efforts to manage and reduce its mobility energy demand. We refer to mobility energy as energy DOD requires to move and sustain its forces and weapons platforms for military operations. Your oversight of this issue is paramount not only to improving the management of DOD's mobility energy, but also helps ensure that we minimize the mission risks our military forces are exposed to in operations.

My testimony will focus on three areas: first, energy issues that will affect DOD operations; second, some of the key departmental and military service efforts to reduce demand for mobility energy; and third, current DOD management approaches to guide and oversee these efforts.

First, many of the energy issues our Nation currently faces have direct impact on DOD. Rising fuel costs, worldwide energy demands, increased U.S. demand for oil, and uncertainties about world oil supplies are just a few examples that underscore the importance of energy to the Nation and to DOD. Fuel costs for DOD are substantial. In 2007 alone, DOD reported that it consumed almost 4.8 billion gallons of mobility fuel and spent \$9.5 billion.

Volatility of world oil prices are likely to continue, which may require DOD to make difficult tradeoffs such as redirecting funds from ongoing programs to pay for needed fuel. Furthermore, the Department is directly and negatively affected by DOD's high fuel requirements on the battlefield. These requirements place, as has been mentioned, a significant logistics burden on our military forces. They can limit the range and pace of operations and can add to mission risk, including exposing supply convoys to attack. Given these issues, DOD must be well positioned to effectively manage energy demands for military operations.

Next, I would like to acknowledge some of DOD's key mobility energy demand initiatives underway. At the department level, DOD created a task force to address energy security concerns. We recognize that the task force is a good forum for sharing ideas and monitoring progress of selected mobility energy projects across the Department. Each of the military services has its own ongoing initiatives.

For example, the Army is addressing fuel consumption at four deployed locations by developing foam-insulated tents and temporary dome structures that are more efficient to heat and cool,

thus reducing the need for fuel power generators. The Navy has established an energy conservation program to encourage ships to reduce energy consumption. The Air Force has developed an energy strategy and is undertaking various fuel reduction initiatives such as determining fuel-efficient flight routes and optimizing air refueling. The Marine Corps has initiated research and development efforts to develop alternative power sources and improve fuel management.

Finally, although DOD has taken some positive steps to address mobility energy, it lacks key elements of an organizational arching framework to guide and oversee these efforts. First, DOD's current approach lacks high-level leadership necessary to advocate and coordinate mobility energy issues across the Department. Without effective leadership, the Department has been unable to comprehensively address the development of a mobility energy strategic plan and improve coordination among DOD stakeholders. DOD's current approach to mobility energy is to centralize. Responsibilities are diffused among several DOD and military service offices and working groups without a single focal point who is accountable for mobility energy across the Department.

As I stated, the establishment of the task force is a positive step. However, this task force has been unable to develop policy, provide for guidance for oversight, and be the advocate for mobility energy Department-wide. For example, it does not have a seat at the table in executive-level Department discussions such as the Joint Requirements Oversight Council or the Defense Acquisition Board. Moreover, the individuals that lead the task force do so as an extra responsibility outside their normal work duties.

It is also relevant to point out that DOD has established a focal point for facility energy, which accounts for about one-quarter of DOD's total energy consumption. Mobility energy accounts, as has been mentioned, accounts for about three-quarters of the total energy consumption, yet there is no equivalent focal point to lead, advocate, and coordinate for these issues.

Second, there is not a strategic plan for dealing with mobility issues. Key elements of this plan would include DOD-wide goals, priorities, resource requirements, timeframes for implementation, and performance metrics to evaluate progress. While we are not recommending specific goals for the Department, we note that back in 2002, the Commandant of the Marine Corps established the goal to reduce fossil fuel consumption by 10 percent in the year 2010.

In closing, we issued a report today that recommends that DOD establish an over-arching organizational framework for mobility energy. To establish such a framework, DOD should designate an executive-level official who is accountable for mobility energy matters, develop a comprehensive Department-side strategic plan, and improve business processes to incorporate energy efficiency considerations.

In addition, we recommend that the military services designate an executive-level person to establish effective communication and coordination among DOD and military services on Department-wide mobility reduction efforts, as well as to provide leadership and accountability for their own efforts.



With a mobility energy organizational framework in place, DOD would be better positioned to reduce its significant reliance on petroleum-based fuel and address energy challenges for the 21st century.

This concludes my prepared remarks. I will be happy to answer any questions.

[The prepared statement of Mr. Solis can be found in the Appendix on page 81.]

Mr. ORTIZ. Thank you, Mr. Solis.

Before we go into the phase of questioning, I would like unanimous consent to allow members of the House Armed Services Committee to participate in the subcommittee hearing. After consultation with the minority, I ask unanimous consent that Mr. Bartlett and Mr. Davis, members of the House Armed Services Committee, be allowed to participate in today's readiness hearing and be authorized to ask questions from the witnesses. Mr. Bartlett and Mr. Davis will be recognized at the conclusion of questioning by the members of the Readiness Subcommittee. Hearing no objection, so ordered.

We thank you so much for your testimony this morning. I think we can learn a lot from you. This is something that all of us need to work together to be able to bring the savings that we need to. I know it is harder on my family to be paying close to \$4 a gallon.

Mr. DiPetto, based on your experience with the fully-burdened cost of fuel pilot programs, what do you see as the biggest challenge to implementing a fully-burdened cost of fuel mentality? Do any of these challenges cause you to reconsider whether this is a good idea to do that?

Mr. DiPETTO. Let me answer the latter part of the question first. No, none of the challenges we have experienced so far in executing the pilot programs would cause us to re-think whether this is a good idea or not. Clearly, there are some challenges. We are nearing the conclusion, hopefully this summer, of the pilot programs. We have learned quite a number of lessons in executing these.

One of the biggest lessons we have learned to date, it has become quite apparent that the acquisition trade space is significantly constrained by decisions in the force planning and requirements business processes that precede it. So without applying fuel considerations and the value of fuel delivered to the battle space very early in DOD's corporate processes, there is a limit to what we can do in the acquisition trade space. So I would probably highlight that as our biggest initial observation in the pilot program.

Again, nothing that we have learned so far would question the initial assumption that this makes good sense and is something the Department should do.

Mr. ORTIZ. So you think we have taken the right steps?

Mr. DiPETTO. Absolutely. We are still maturing the methodology and the analytical approach. We still have a lot of work to do to incorporate it, even in the acquisition business processes. But yes, I think we are on the right path.

Mr. ORTIZ. Mr. Army, DOD's installations are required to meet many energy goals. Could you more or less enlighten us or elaborate on DOD's plans to achieve these goals with an emphasis on the two that DOD and the services have at their disposal? Also, in

your written testimony, you identify some concerns about meeting some of the new requirements. Could you elaborate on these concerns? I know I am asking too many questions, but maybe you can respond. Does the Department need any legislative assistance to meet these goals? Can you give us an idea?

Mr. ARNY. We have a number of tools. Again, as I mentioned in oral testimony, you all had reauthorized some of the Energy Savings Performance Contracts (ESPC) that we have, so we are able to proceed forward. Let me give you an example of where we were able to use it was at the carrier pier in Ukuskit. We have a power plant. We are about to put in a large military construction (MILCON) project to upgrade that for when we bring in the nuclear carrier. We were able to do that with no money up front through ESPC by bringing in a developer who could develop the power plant, charge us the same amount of money. Instead of one kind of electricity, we get both 60- and 50-cycle power, as well as the level of pure water that we need to work with the carriers.

So we have a number of those in place. Part of our problem I see, we are analyzing the latest legislation to see how that affects us, so I have to get back to you on the answer to that. But we do have tools in place. We do think we can meet the goals. It is harder because in the directives we are asked to go on a steeper slope, but working with all the services, we believe we can meet those targets.

[The information referred to can be found in the Appendix beginning on page 103.]

Mr. ORTIZ. I would like to allow my good friend Mr. Forbes to introduce a new member from the minority who is with us.

Mr. FORBES. Thank you, Mr. Chairman.

We are delighted to have with us today our newest member of the Armed Services Committee and also the Readiness Subcommittee, Mr. Rob Wittman, from the First District of Virginia. He likes to refer to it as the first district of America, but we are certainly excited to have him with us, Mr. Chairman. Thank you for that opportunity. We are delighted to have him and looking forward to great things from him.

Mr. ORTIZ. Welcome. They told me you would be the one that would be able to solve the energy crisis. [Laughter.]

Let me yield to my good friend, Mr. Forbes, for any questions that he might have. In a few minutes, we might have to recess. I don't know how many votes we have, but when I look at those lights—but is it two votes now? So let me go ahead and yield to my good friend, Mr. Forbes, for any questions that he might have.

Mr. FORBES. Mr. Chairman, thank you so much. Again, I want to thank you for your leadership in holding this. We have had a couple of really important hearings this week, and we thank you for your vision on doing that, and for your patience in the number of questions that I think all of us would have.

Mr. DiPetto, first of all, I would like to ask you, in your written statement you make a brief comment regarding your limited ability to perform analysis, for example through modelings and simulation, war-gaming, and other accepted tools in order to determine what it is worth to the larger force to invest in fuel efficiency technology. I am a firm believer in modeling and simulation, and the

dollars it saves us and the forecasting abilities it gives us. What needs to be done to ensure the Department has the modeling and simulation tools it needs to aid in making these value judgments?

One of the challenges in implementing change is that you have to get buy-in at the lowest levels. Do you believe that having appropriate modeling and simulation tools would increase warfighter awareness and advocacy of energy efficiency in the Department?

Mr. DiPETTO. In one of my other hats, I sit on DOD's modeling and simulation (M&S) steering committee, Congressman Forbes, so I, too, agree on the value of modeling and simulation. In my written statement, I was referring to the lack of those tools up front in the business processes to let us actually see the consequences of the fuel demand in the battle space. One of our hopes is that as we sort through the Department's vision on energy posture and develop our strategic plan going ahead, some of those priorities will be reflected and realized as we execute the strategic plan going forward.

What we are talking about there is specifically the tools to let the warfighters, both in campaign analysis and in variety of analytical agendas, actually see the utility of reducing fuel in the battle space and how the burden of fuel detracts from combat capability. So I would be a firm supporter, and I think we will push going forward in that area. It is a little out of my lane. I am an acquisition guy, but we see the need, as I mentioned in answering the chairman's question, to poke earlier in the corporate processes the value of fuel, and M&S would be a big enabler to that.

Mr. FORBES. If you determine that there are any specific things that we can do, if you would submit them to us for the record so that we can work to try to do that, we certainly want to make sure those tools are available and we are moving forward with them.

Mr. DiPETTO. Yes, sir.

[The information referred to can be found in the Appendix beginning on page 103.]

Mr. FORBES. I have two other questions. One of them is a little bit larger, then General Carns, one for you that if we have time for you to answer, if not, maybe you could submit it for the record. The big concern I have is, I am aware that section 526 of the Energy Independence Security Act of 2007 prohibits any federal agency from contracting for an alternative or synthetic fuel, including the fuel produced from nonconventional petroleum sources unless the contract specifies that the life-cycle greenhouse gas emissions be less than or equal to the emissions from conventional fuel.

My question for any of our witnesses, if you can comment on the impact of this legislation to the DOD and to the U.S. economy and security. Is it likely that this legislation will only make us more dependent on Middle East oil because we cannot rely on sources such as Canadian tar sands to meet our Nation's petroleum requirements?

Mr. ARNY. Sir, I wanted to mention that earlier. The problem we have with that is we are trying to figure out exactly what it says. Many of the provisions are ill-defined, and we are just not sure how it will affect us. We have the same concerns you do, and we would like to work with you to see if we can't, with the subcommittee, refine that. The goals seem laudable, but we are just

not sure of the effect, and we have some of the same concerns as you do.

Mr. FORBES. Well, if you could get back with us when you get that information, I think this is a very costly thing for us and could be one of those things where we have some unintended consequences that could be rather devastating. So anything you could submit for the record.

[The information referred to can be found in the Appendix beginning on page 103.]

Mr. FORBES. General, I know we have to run for a vote, but one of the things—you made a comment that I think is very appropriate. I just want to quote it again, if I can, but you said, “Logistics is a vulnerable soft underbelly for us and a target-rich environment for our enemies. The larger our logistics tail gets, the more difficult it is to protect and more combat power we must divert from combat operations to assure its safety, and the more casualties we take because our supply trucks can never be as survivable as our combat vehicles.”

I have always been interested in logistics because Fort Lee is in my district and we like to refer to them as the logistics capital of the Nation, sometimes the world. It is not sexy what they do, but it is so vital to the operations we have. If we implemented all the DSB recommendations today, it would still be years before we began to see the full effect. My question today is, what, if anything, can be done today to reduce the risk to our forces that are currently engaged in the global war on terror?

As you answer that, let me just point out for those listening today, we are now transporting in just fuel alone into Iraq on a daily basis about 1.5 million gallons of gas a day, with 200,000 gallons coming in per day from the north; about 500,000 gallons coming in from Jordan; and about 800,000 gallons coming in from Kuwait. The lines—we have pictures—are sometimes as long as 32 miles long. I mean, that is a very real risk that we have, a very difficult logistical problem.

General, what can we do as quickly as possible to protect those forces that are there?

General CARNS. Mr. Congressman, I would first say our near-term alternatives are always limited because we have already capitalized the systems. The Congress has been most generous in funding such efforts as the Joint Improvised Explosive Device Defeat Organization (JIEDDO), which has made a material difference in reducing casualties, as well as the more-armored vehicles. But so far as what we can do near term, there are very limited options.

In the medium and long term, there are a number of suggestions in the report that emphasize if we can make the systems more efficient, we need less fuel, and of course we get more fight. In that respect, it is that we have to get very serious about innovative research and competitive prototyping, rather than trying to just put appliques on existing systems.

In that respect, a program like Reset, which the Army is committed to and is on the order of an \$85 billion program, in my estimation puts us too much back to the future, rather than in the future, in the sense that we are going to refurbish what we have,

rather than forcing technologies to give us new capabilities which are so desperately needed.

When we designed the systems we now have, our expectation was that we would have a safe rear area. We are now in a situation where we do not have that luxury. We have to adapt and build new innovative ways to make sure we can reliably operate in this hostile environment and supply the forces with the logistics they need.

Mr. FORBES. Thank you, general.

Mr. Chairman, I yield back the balance of my time.

Mr. ORTIZ. Thank you.

We are going to recess hopefully for 10 minutes, and we will be coming back. The next member to ask questions when we return is going to be Mr. Hayes. So we are going to be recessing for about 10 or 15 minutes, and I hope there is no other vote to adjourn.

Thank you.

[Recess.]

Mr. ORTIZ. Okay, our hearing will resume. Mr. Hayes will be the first gentleman who has some questions, right?

Mr. HAYES. Thank you, Mr. Chairman.

Gentlemen, thank you. As you may know, I represent Fort Bragg and Pope Air Force Base. We appreciate the efforts that the military and you in particular are making to develop alternative sources of energy which is critically important. I mentioned to you on the way out that I would like for you to comment on how the Germans were able in the last two years of World War II to operate their military on synthetic fuel, and relate that to what we are doing now.

Also, if you would talk a little bit more about what is being done at Fort Bragg and in the Air Force in developing alternative fuel sources. As you are commenting, I would appreciate your comments on us not losing sight of the bigger energy picture, whereby exploration, nuclear power, gasification of our most abundant resource, coal, and how all those things play in. If anybody would like to start, please do so.

Mr. DiPETTO. I could start.

Sir, it is my understanding historically that the Germans used or actually developed a process for liquefaction of coal when they were denied the ability to use conventional petroleum resources to fuel their air force. The process is called Fischer-Tropsch, which I think the South Africans are still doing to this day. It is called liquefaction process. That is about as deep as I go on that issue.

Regarding the Air Force efforts on alternative energy, they are in fact proceeding down a path to test the use of synthetic fuels in their major mobility aircraft and some of their combat aircraft as well. So they are on a path to test and certify those fuels to give them the ability to use the fuel. I think that is about as deep as I can go.

The other issues, I am going to hand over to Wayne. I think the nuclear—

Mr. ARNY. I do know that the Air Force, as far as installation, the Air Force is looking at, as the lead agency for us, looking particularly at is it feasible to do nuclear power on some basis. We are

all interested in what are the parameters of that and what are the pluses and minuses. That will be examined by the Department.

As far as other forms of installation energy, we have geothermal plants in the west. We are putting more solar. We are using the energy legislation we have now to modernize. We have a lot of old power plants. We are either privatizing them or trying to modernize them. Just by putting in new equipment, we get better efficiency out of it. So there are a number of things we are doing in terms of, for instance, very simple things.

We never metered the homes or any of the buildings that we had on our bases. Energy was just a cost we paid. We are now beginning to meter all of our homes whether they are privatized or whether we own them, and incentivizing the residents to conserve energy. In the old family housing when I was a junior officer, you could have the air conditioning running with the windows open. It didn't matter because you didn't pay for it. Now, we are incentivizing the members to conserve energy as well.

So we are trying to do as much as we can using every aspect that we can get to. As I said, we are doing more and more exploration for geothermal using the profits that we get from the existing plant. We are also looking to extend that to exploit potential energy sources that are under our bases which we really don't have the incentive to do right now. So there are a number of things we are trying to do.

General CARNS. Congressman Hayes, if I could comment very briefly. The Germans thought up those ideas for the same reason we need to do so. Namely, they were in a crisis. There was not another alternative and so innovation bloomed very quickly. The price of oil is driving us obviously to be more innovative, and if there is a criticism it would be that we are not moving fast enough.

In that respect, you mentioned nuclear. I would offer the following operational perspective. As mentioned earlier, we have notionally identified a number of capabilities at installations which are essential for maintaining situational awareness and being able to execute the forces in support of national security objectives. In that respect, nuclear provides an interesting opportunity in that were we to put nuclear capability, nuclear power generation capability in selected locations, we have the opportunity to put it in a secure environment on an installation, and we have a way to not only provide power to the base, but if there were a major interruption in an area or a region, these facilities could probably provide considerable power for the surrounding area.

It will not work to have a large power outage where we crank the generators on the base and light up only the installation, while the civilians who live within 10, 20, or 50 miles live in darkness for days or weeks or more. So nuclear is one of the alternatives that may be a very interesting option and it provides a secure federal facility to put it.

Mr. HAYES. I appreciate those comments. To wrap up, Mr. Chairman, I think if people were to go back and look at the so-called nuclear accidents—and Mr. Bartlett is much more of an expert than I am—the things that were left out of the construction of the plant in Chernobyl and the other things that happened, if you have some

real skeptics, it means that with modern techniques and proper supervision, nuclear is extremely safe.

Last but not least, if the oil speculators who are holding us up for foreign oil were to see us get more actively involved in additional exploration, nuclear and others, that would be a good backstop against the marketplace.

Thank you, Mr. Chairman.

Mr. ORTIZ. Thank you.

My good friend from Mississippi yields to our friend, Mr. Courtney.

Mr. COURTNEY. Thank you, Mr. Ortiz.

Thank you, Mr. Taylor.

I actually just have a quick question, which maybe I can start with Secretary Army. There was in the last defense budget some funding toward Specialized Technology Resources (STR) Technology in Connecticut. They make the fabric for solar panels which are going to be incorporated into pop-up tents and actually backpacks to power radio equipment. Again, this is a firm that is doing lots of work for the German effort to promote renewable energy. Again, it was exciting to go to this facility where they are probably looking at adding about 100 new production jobs based on this contract from the Department of Defense.

When you think of solar, you always think of stationary panels that are installed in buildings. Again, is it the Pentagon's intention to really try and use it in other more nontraditional manners?

Mr. DIPETTO. I can take that question, congressman.

I am not familiar with that specific effort, but in general if one looks at the cost of delivering the fuel to run generators, for example, in the battle space, renewable power, onsite generation has a huge advantage in terms of reducing the logistics flow of fuel to theater if you can generate power organically right there.

Certainly, solar is one aspect of getting at that demand reduction, but on the supply side, onsite generation from something like wind or solar organically, or even for the combat warrior on foot, re-charging batteries. So there is a terrific application in-theater for that type of technology. I am not familiar with that specific effort, but—

Mr. ARMY. Is this technology just man-carried, or is it for facilities as well?

Mr. COURTNEY. Again, the specific contract was for man-carried. Again, obviously, we have people deployed in parts of the world where there is lots of sunlight, so it would seem like a pretty smart direction

Mr. ARMY. Absolutely. I will take a look at it. Also, I know for our buildings, again as one of the members mentioned, this is all driven by cost and having to save. One of the things that we are doing, a lot of our buildings, as you have seen, have flat roofs on them, and we tend to paint them black. We are now looking at—not just us, but the private sector as well—at embedding solar panels in the roof just to keep bringing electricity.

And the solar technology is getting better and better. As the technology goes, as the price of fuel goes up, it becomes more efficient. In the early days, we were having to subsidize our solar. To me, it was a little bizarre being basically a private sector guy, that

out in San Diego we put solar panels in a parking area, you know, with nice sunlight, and we subsidized it with our geothermal revenue, but we also had state subsidies in there. I thought that was a little strange that, okay, the Federal Government is getting subsidies from the state. But anyway, it worked. But now it is becoming more efficient.

In particular, the 14 megawatt plant at Nellis, they have a long-term energy contract to buy electricity from that cheaper than they would have with the price of electricity they were getting. Ten years ago, you couldn't have done that.

Mr. COURTNEY. I would like to again follow up with you in terms of this project, which again, it is very exciting. Again, you are right. The photovoltaic technology is just improving and becoming more efficient so that you actually can squeeze more out of every square foot.

So thank you, Mr. Chairman.

Mr. ARNY. You know, in hangars, we are even putting in huge fans. If you think about it, put giant fans in the top of aircraft hangars just to keep the air moving to keep it running more efficiently. There are lots of new technologies.

Mr. ORTIZ. Mr. Wittman.

Mr. WITTMAN. Thank you, Mr. Chairman.

It is great to be part of this committee and it is great to be learning about these readiness issues. I appreciate the opportunity.

The U.S. Air Force has articulated ambitious goals with respect to the development and use of domestically produced synthetic fuels. Those things include accelerating the development and use of alternative fuels, increasing the use of synthetic fuels to 100 million gallons in the next 2 years, and certifying the entire fleet on Fischer-Tropsch (FT) fuel by 2011, and having 50 percent of the U.S. Air Force fuel being synthetic fuels by the year 2016.

Just a couple of questions within that particular framework. What steps are being taken to ensure that the U.S. Air Force will be able to achieve these goals that they have put forth? And what steps are being taken to ensure that section 526 of the Energy Independence and Security Act of 2007 will not interfere with the U.S. Air Force goals?

Mr. DiPETTO. I am going to try and answer that one as best I can. I am not a fuels guy. I am an acquisition demand-side guy. I might have to defer you for specifics to the Air Force. The Department's position on alternative fuels recognizes that DOD, because we are such a small percentage of the fuels market, will never be a market-driver. However that said, we very well might be a market participant down the future. So the Air Force efforts in certifying and testing probably go along those lines to becoming a potential market participant.

That said, the under secretary—and I believe he speaks for the deputy secretary—recommends we take a very cautious approach to alternative fuels across the board. One recognition is that supply-side solutions don't particularly solve our most pressing problems, which is the cost of delivery of fuel into the battle space. We feel and various Defense Science Board studies have recognized that as DOD's most pressing challenge. But some of these type of issues, the recommendations of the various recent studies, the Air



Force efforts will be sorted out as we develop the Department's energy strategic plan debriefed up to the Deputy Secretary in the coming months.

Mr. ARNY. Let me, if I could, I will add to that. I know that the Air Force has stated publicly that they are looking for—I won't say cost-equal, but it must be cost-effective and have no larger footprint than they can get under conventional fuels. As I said earlier, the Department is examining the effect of section 526 on all our aspects, and we intend to come back to the Congress with the answer on that.

Mr. WITTMAN. Thank you. Yes, I know that those goals are very aggressive and we just wanted to try to gauge where the effort is.

Mr. ARNY. If I recall, I was with Mr. Anderson yesterday when he was talking about it, they are targets, rather than goals. That is what they would like. If they don't get there, it is an effort to break new ground. So if they don't make the targets, but they make progress, that is also progress.

Mr. WITTMAN. I know they are looking across the board as far as synthetic fuels. One of the efforts I know they are pushing to undertake is coal to liquid fuel, and I know that is an aggressive part of the process I just wanted to gauge. Is that still continuing to be part of the strategy that they are pursuing in this transition to increasing synthetic fuel use?

Mr. ARNY. I believe so. We will get you a specific answer on that.

Mr. WITTMAN. One additional question, in DOD's response to GAO's report, DOD stated that it plans to address the issue of military service governments and oversight of energy matters once it completes its strategic plan in May, 2008. However, the military services have various mobility energy reduction efforts currently underway.

In the absence of executive-level military service focal points for mobility energy, how are the services prioritizing their own efforts and ensuring effective information-sharing with each other and with the Department?

Mr. DiPETTO. Again, I cannot speak for the services, congressman. However, we have some visibility in our acquisition role in overseeing major defense acquisition programs and the acquisition of tactical systems. So we have some visibility into how the services are addressing mobility fuel. They have been participating with us on the fully-burdened cost of fuel pilot programs to shake out the methodology to move that forward hopefully next year. We are working three pilot programs with each of the service.

But in terms of service priorities on mobility fuel, I would have to defer to the services on that. I don't have any insight on that.

Mr. ARNY. But we do bring it together at OSD, and we are trying to do a better job. Obviously, energy has become much bigger since I have been here. I know Al Shaffer chairs the Energy Security Task Force, which has participation by all the services at senior levels. We are doing more and more of that, because we do need to prioritize all these efforts and bring them together and make sure they all make sense across the Department.

Mr. ORTIZ. Thank you.

Mrs. Boyda.

Mrs. BOYDA. Thank you very much, Mr. Chairman.

Energy is such an incredibly important topic. When I talk about energy back at home, I talk about it from a national security standpoint, so having you guys here today really is that intersection of national security, from whether you are driving in Kansas or trying to fight terrorism.

I apologize. I have had to be kind of in and out, so I may be going over plowed ground already. But so many of us have talked about this go-to-the-moon with National Aeronautics and Space Administration (NASA), when John Kennedy said in eight years or before the end of the decade, we are going to go to the moon. We have all said that we need a comprehensive energy policy and somebody who really has firm hands on that steering wheel and is guiding this. We haven't had that. We haven't even gotten close to it.

Is there any vision or is there any possibility that—again, if we have already been talking about this, I apologize—but is this task force or is there a possibility that the United States military will be able to bring together the research that is needed, the brains that are needed? You have a huge laboratory. It is called the United States Air Force, Army, Marines, nuclear submarines. Are we envisioning any of that?

Mr. SOLIS. I will just take a quick stab at that. I think the military does have the ability to do it, but I think in the current organizational structure and lack of overall leadership, particularly on the mobility side, I think it is going to be a real challenge to bring all that to bear.

The question was just asked about do we have oversight of what the military services are doing and is everybody going in the same direction in terms of goals and objectives, and are we on the same wavelength. You know, there has been a lot of discussion today about individual initiatives, and those are all great and good, but the question is, how are they achieving the goal of reducing, say, energy fuel demands in a forward-deployed operation? What are we doing?

I mentioned the Marine Corps commandant to you. Several years ago, he put a goal out there to reduce by 10 percent. You know, those are the kinds of things when you have to look across and say, are we positioned to do this.

Mrs. BOYDA. We had something called NASA. We didn't get to the moon because we had a few task forces here and there. We got to the moon because somebody took some leadership. You have not been given that mission, clearly. But if you were, and I know today we wouldn't have the capability, but if you were, what would you think about it being, is it even a reasonable mission to assign not to one branch of the military, but to our DOD?

Mr. ARNY. Chris had mentioned it, and in my testimony I talked that while we do consume, and we are the single largest consumer of energy, we are still between one percent and two percent. We do rely on the private sector. I believe we do have leadership in this field.

When it comes to mobility vehicles, as far back as 20 or 30 years ago, I know in the destroyers and cruisers, the guys working—everybody works on a weapons system. I flew F-4s. We all know how to conserve fuel and when we have to. I could stay airborne in my

F-4 for three hours. It was a boring flight because I wasn't doing much. On the other hand, I could come back empty in 10 or 15 minutes with the same load of gas because I was on a combat mission.

Mrs. BOYDA. What I am looking for is not so much applications to the military. I am looking for applications on the civilian side.

Mr. ARNY. I am not sure that it is the mission of the Defense Department to lead that. We have our own problems, again within installations in my field, within mobility, that we all wrestle with. Every operator wrestles with that. We rely on the private sector to bring that to us. A lot of the things we are doing in installations is not stuff that is new to us. It is exploiting what the civilian industry is doing.

Mrs. BOYDA. What do you see is the leadership role? Mr. Hayes was speaking about it, but I have been one to say we should not start digging tomorrow. We are not going to start digging tomorrow, but why we are not really aggressively bringing nuclear into the overall discussion. We are paying for that decision every day that we let it go by.

Certainly, I would think that we have a lot of good nuclear. The Air Force is building some small nuclear—

Mr. ARNY. No, they are not building. They have gone out with an RFI—request for information—on what is available. You and Congress, and I know we have seen people will come to your door and say, I can do X for you. And you peel away the skins of the onion and you find there is nothing there. So the Air Force has gone out with RFIs and said, okay, what can you do for us, in what timeframe, at what cost.

And we will get that information back and look at it from the Air Force as a department, and then sit down and say, does this make sense. If we put this power plant on a particular base, does it make sense economically. Because let's face it, people are trying to buy weapons systems and personnel costs and medical costs, so we have to compete for dollars to do things with other things.

So can this be done economically for us, and our economics may be different than the private sector so it may work that way, but then also does that plant encroach on the base? Is there enough excess space on that base for something like that? What are the aspects? How do you tie it into the grid? There are all sorts of things that we will look at. I think, frankly, like it or not, we are in the lead on that.

Mrs. BOYDA. It works for me.

Mr. ARNY. That is why we have to be careful about it.

Mrs. BOYDA. Thank you.

Mr. ORTIZ. Mr. Taylor.

Mr. TAYLOR. Thank you, gentlemen, for being here. You have certainly raised some interesting thoughts. I am not so sure I am hearing any answers.

Number one, if 75 percent of our fuel is mobility, and if the Navy is a significant portion of that, we really don't have an option on planes just yet. We really don't have an option on Humvees just yet. We do have an option on the propulsion of naval ships. We were going toward an all-nuclear surface fleet, then we got fat and

lazy when oil was cheap. I haven't heard you guys talk about the importance of doing that.

We have another generation of cruisers coming along. This Congress has passed legislation that says that next generation of cruisers is going to be nuclear powered. We are getting some pushback from the Navy. And quite frankly, if it made sense when we did the study a year ago at \$70-a-barrel fuel, you guys ought to be all over it at \$110 fuel. I haven't heard a word on that, and the need to take other plants where applicable and make them nuclear powered.

The second thing, even on a smaller scale, I am just curious. I consider myself kind of a mechanical nut. I am amazed when I go to visit the troops in the field and see those diesel-powered generators. In any base you go to in Iraq or Afghanistan, there is just the deafening sound of those generators. Those generators are powering electric water heaters, electric heaters in barracks.

Although on commercial boats and even recreational boats, it has been common for years to have the heat exchanger, the heat coming off that engine going through a heat exchanger to warm the water on the boat, to warm the people on the boat through something like your car heater. I have yet to have seen that on a military installation.

Now, that is two commonsense approaches that I can buy today from Hamilton Marine catalog that I haven't seen on a single military installation. Why not? As a matter of fact, I have both of those things on my boat. So why isn't the DOD doing it? And why aren't you guys recommending it? I take the engine, the heat. The hot water coming off my engine heats my boat in the winter and heats the water that I use in the shower. And yet I have never seen it on a DOD installation.

Mr. ARNY. On an installation or on a——

Mr. TAYLOR. A base where you are using a generator. And again, those generators, you made us aware of what is well over one million gallons a day we are trucking into Iraq and Afghanistan.

Mr. ARNY. I believe on our domestic——

Mr. TAYLOR. And believe me, I want the kids to take a hot shower during the winter. I want the kids to be warm in their barracks, but again, those are commonsense approaches that are available through the private sector that I have yet to see on a military installation. Why not?

Mr. ARNY. I will have to get back to you on that.

For deployed forces especially, I don't know the answer. For the stateside installations, obviously the diesel generators are used for backup.

[The information referred to can be found in the Appendix beginning on page 104.]

Mr. TAYLOR. I understand. But let's talk about deployed, particularly deployed.

Mr. ARNY. I can't answer that for you.

Mr. TAYLOR. One of the last visions I have of going to Kuwait is seeing a 300-truck convoy forming up, and knowing that every inch that those guys are traveling could be the inch that is mined, and that is going on every day, the days whether I am there or not. They are performing a very important function, and quite frankly

if I was an enemy of the United States, the first thing I would do is go after our fuel supply.

Mr. DiPETTO. Congressman, in terms of the deployed use of energy, forward operating bases, the Department recognizes the problem delivering fuel to the battle space in those vulnerable supply convoys. We have a group called the rapid equipping force which is actually working in-theater right now to tackle the problems you are raising. They are looking at it on both the demand and the supply side. The demand side is looking at more efficient generators in whatever capacity. I can't speak specifically to the systems that you referenced, but clearly more generating efficiency would reduce that need for fuel in-theater.

They are also looking strongly on the demand side. Insulating tents, for instance, has brought down the need for fuel to run those generators incredibly. Some renewable power solutions are also being looked at, but the Department recognizes the severe burden by inefficient generators, as you mentioned, in-theater.

Mr. TAYLOR. No, you are not making use of the incredible amount of heat that is available just in the water that is cooling those generators. By using the heat exchanger, you would have more than enough hot water for all the showers. By using the heat exchanger—again, it is not going to work if the tent is two miles from the generator, but if the tent is 200 yards from the generator, that ought to be very simple.

Mr. DiPETTO. I will take that back, sir. We are looking at all solutions. The magnitude of the problem—

[The information referred to can be found in the Appendix beginning on page 104.]

Mr. TAYLOR. Well, apparently you are not. If I can figure this out, then you are not doing your job. Sorry. Again, without a word on nuclear, which is something that Admiral Rickover was exactly right about 30 or 50 years ago. Again, I would think that your boards ought to be the ones saying to a reluctant Navy, guys, this is the only way to go; accept the future. And we are going to have to change some things, but this is the way we have to go.

I would welcome your comments on either one of those. We don't exactly have a big crowd in here, and I think the chairman would waive the five-minute rule for a minute or two.

Mr. ORTIZ. Sure. Go ahead. And I was just wondering, you don't come to testify on the research that you are doing. Do you have any limitations as to what you can look at?

Mr. DiPETTO. I am sorry, sir. Limitations to research?

Mr. ORTIZ. Yes.

Mr. DiPETTO. The major limitation is that everything needs to compete in the budget year with other priorities we have. That is typically the limitation. And it also has to compete on an economic basis, so business cases certainly get looked at.

I cannot speak specifically to the congressman's concern about nuclear power in cruisers, but I know the Navy is extremely motivated to do the analysis properly. Particularly, I don't have any specifics on it. I could take that back for the record and find out a little bit more about their specific analysis for service ships, for example. It is a little bit out of my lane, but we are happy to take that back.

[The information referred to can be found in the Appendix beginning on page 103.]

Mr. TAYLOR. If I may, Mr. Chairman.

A year ago, we had a study which said for the cruiser it made sense at \$70-a-barrel fuel to go nuclear. At the time, the Landing Platform Dock (LPD) was right on, to use a carpenter's analogy, right on the bubble. That was at \$70 fuel. What is amazing is that now that it is at \$110, I don't hear anyone from the Navy who ought to be proposing this, saying, you know what? It is time for a nuclear-powered LPD and large-deck amphib. I would think someone within the DOD would be taking the lead on this.

Now, I don't mind doing it, and Congressman Bartlett certainly doesn't mind doing it, but that really ought to be coming from the uniformed services. And ought to be willingly accepted by the uniformed services, rather than something we literally seem like we are forcing it down their throats. So how would you change that, sir? I would think that is what your panel is all about.

Mr. ARNY. Mr. Taylor.

Mr. TAYLOR. Yes, sir.

Mr. ARNY. I agree. We need to take a look at it. I don't know the study referred to, but if it was effective at \$70 a barrel, it ought to be more so at \$110 a barrel. There may be some other supply, tonnage, weight, redesign of a ship into it, but we definitely from the OSD perspective should push that analysis to make sure, because there are definite advantages. I flew off nuclear-powered aircraft carriers. I also flew off conventionally powered carriers. There is definitely an advantage to nuclear power, especially in the aircraft carrier business.

So we will push that with the service, the Navy, to make sure that that analysis is complete, and then get back to you.

[The information referred to can be found in the Appendix beginning on page 104.]

Mr. TAYLOR. Thank you, Mr. Chairman.

Mr. ORTIZ. I think Mr. Taylor has had some good recommendations. It is the small little inventions that can grow into something big. I hope that when you guys study it, maybe give us some answers that we can work with.

I am sorry. Go ahead.

Mr. ARNY. You can see the efficiency as we have in nuclear power. The *Enterprise*, which is still out there, had I think eight generators on it, and now we do it with two on a carrier, on modern carriers. So the plants are more efficient as design propels itself. Back then, it was definitely not cost that was driving it. If it had been cost, we would have not put nuclear power on those ships because it did cost more in the end.

As a matter of fact, you remember the great debate over the *JFK* that was supposed to have been nuclear, then it was conventional, and it ended up being conventional. But today, with the price of fuel, you are right. That analysis could swing it and the plants are far more efficient than they were 30 or 40 years ago.

Mr. ORTIZ. Mr. Bartlett.

Mr. BARTLETT. Thank you very much. And thank you again, Mr. Chairman, for letting me sit in on your hearing.

My good friend, Mr. Taylor, mentioned Hyman Rickover. We fortunately listened to him about nuclear for submarines, but we didn't listen to him when he gave what I think will shortly be recognized as the most insightful speech given in the last century. Hyman Rickover gave a speech—it will be 51 years ago, on the 14th day of this May—to a group of physicians in St. Paul, Minnesota. It is the most insightful, prophetic speech that I have read relative to the problems that we are discussing today, that is energy.

He noted that we were about 100 years into the age of oil, and that out of 8,000 years of recorded history, there would be a brief age of oil. He didn't know how long it would be. Now we know pretty certainly how long the age of oil will be. We are 150 years into the age of oil, and in another 150 years we will be through the age of oil. Hyman Rickover knew that would happen. He said that how long it lasted was important in only one regard: that the longer it lasted, the more time did we have to plan the necessary transition from fossil fuels to renewables.

Now, we have done absolutely nothing to plan for that, with no more responsibility than the kids who found a cookie jar or the hog who found the feed room door open. We have just been pigging out on fossil fuels. And they are a finite resource.

General Carns, you very wisely suggested that we ought to have nuclear electric generation at our military facilities. You are exactly right, sir, we need to be able to island those facilities because the grid is on the edge. When that power goes down, we will not be able to fight if we can't island ourselves, and nuclear is a great way. I would suggest, sir, that the first place we ought to do that is in Guam. There, the only electricity I think comes from diesel fuel, which is hauled in boats to the island. It is our most western landmass, very strategically located. We own about a third of the island?

And there, your suggestion that we ought to be giving electricity use to the surrounding population would work perfectly. I talked to the commanders there and they understand that. I would hope that you could use your good influences to push and act in that direction.

And I would hope, sir, that when we do that, following Mr. Taylor's suggestion, we really ought to be using what we call "district heat." I think we are probably the only country in the world that stupidly places our power plants outside the cities and then uses evaporated drinking water to dissipate the heat. Everywhere else in the world they locate them near population centers. And they use the heat that Mr. Taylor mentioned to heat your buildings, and so forth, in the wintertime, and cool yourself with the ammonia cycle refrigeration in the summertime with this excess heat. So I would hope that we would do that.

By the way, we are talking about energy here as if it were fungible. Energy is really not all that fungible. I am pretty sanguine about our electricity future. With more nuclear, I think there could and should be a lot more nuclear with wind and with solar and with micro-hydro, we can, I think, meet our electricity needs. I am nowhere near as sanguine about our liquid fuels. There is just no silver bullet there. There is nothing out there in the near future

that comes even close to providing the quantity and quality of the 88 million barrels of oil that we pump a day—22 million of those we use in our country.

I really want to commend the military. You are the victims, and you are planning now. You are the victims of the fact that our country, in spite of signals that have been there for a very long time, that we would be here today talking about this issue with \$110 oil was absolutely inevitable. It had to happen. Oil is finite. Hyman Rickover 51 years ago knew that we would be here today. It is inexcusable that our government has had no energy policy. And you in the military, thank you very much. You are doing more than any other entity in our country.

You know, the evidences that we would be here are incontrovertible. Our country peaked in oil production in 1970, in spite of drilling more oil wells than all the rest of the world put together; in spite of finding a lot of oil in Alaska and the Gulf of Mexico; and in spite of being really good at enhanced oil recovery. In fact, we are getting now eight percent of the world's oil from two percent of the world's reserves. We now are producing half the oil that we did in 1970. The same person that correctly predicted that 19 years before it happened said that about today the world would be peaking in oil production.

Mr. Chairman, just one closing statement. Of the two great entities in the world that follow oil production, the IEA and the EIA, the International Energy Agency and the Energy Information Administration, have both been tracking the production and consumption, which are the same thing. We don't have any stockpile anywhere. We just consume it as we produce it. That has been flat for the last three years. In those last 3 years, the cost of oil has gone up from \$55 a barrel to \$110 a barrel. That is because production is flat, demand is increasing, and the probability is that without some really dramatic thing happening, the production for the world is going to do what it did for the United States in 1970. It is going to drop off.

We now have blown 28 years as a country and as a world, because we knew darn well in 1980 that M. King Hubbert was right about the United States peaking in 1970. We are 10 years down the other side of Hubbert's peak. We have done absolutely nothing in spite of four studies, one of them by the military—a great study by the military, a great study by GAO—saying that peaking of oil is either present or imminent, with potentially devastating consequences. Still, our country has done nothing.

We desperately need leadership in this area. Thank you very much, DOD and military, for providing leadership from your quarter.

Thank you, Mr. Chairman.

Mr. ORTIZ. Thank you so much. You know, sometimes we are so big that we fail to look at the little things that might be able to give us some answers as to how we can solve this problem.

Before I close this subcommittee hearing, I would like to yield again to Mr. Taylor and see if he has any other questions or any recommendations. I think his recommendations are well taken. I think it makes a lot of sense.



Mr. TAYLOR. Could I say just for the record, I am going to get you those examples of what I was talking about on the heat exchangers for the hot water heater, the heat exchangers for the actual cabin heat. Quite frankly, I don't see very much use of that on our naval vessels at all, and I will contrast that with a couple of years ago, the Marines purchased a Ukrainian vessel. They added a mid-body extension to it, by the name of the *Roy Wheat* that is now part of our prepositioned fleet.

One of the things that the Russians had done pretty well was take just the heat coming off the exhaust, used it to super-heat water that actually turned an auxiliary turbine to get a few extra knots off the ship. It was a fairly complicated process. I am sure it had some labor associations with it. But again, they were doing a better job of making use of that waste heat than we do as a rule.

Back when fuel was cheap and plentiful, maybe we didn't have to do stuff like that, but certainly the circumstances are there now where we have to. I would encourage you to do so. In fact, if I am not mistaken on the *Roy Wheat*, they actually disconnected the entire system as part of the transformation from a Ukrainian vessel to an American naval ship. Maybe it is time to look at it and reconnect it.

Thank you, Mr. Chairman.

Mr. ORTIZ. Thank you so much.

As we go on this journey, there just seems to be no place where we can find oil, and if we need it, we need to go to war. And we don't want to do that. So I know that we can work together and we can come up with some ideas. At least I have learned a lot today. I want to thank you for being with us today, for testifying before our panel.

Randy, do you have any other comments to make?

If not, thank you so much for testifying before our committee.

This hearing stands adjourned.

[Whereupon, at 12:34 p.m., the subcommittee was adjourned.]



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# **A P P E N D I X**

MARCH 13, 2008

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**PREPARED STATEMENTS SUBMITTED FOR THE RECORD**

MARCH 13, 2008

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**ORTIZ OPENING STATEMENT,  
ENERGY HEARING,  
READINESS SUBCOMMITTEE, MARCH 13, 2008**

**This hearing will come to order.**

**I thank our distinguished witnesses for appearing before this subcommittee today to discuss energy use and management at military installations and for military operations.**

**Energy issues cut across all Department of Defense organizations and functions. Managing the demand for energy is vital not only at facilities but also for fleet vehicles, surface ships and submarines, aircraft, and tactical vehicles.**

**The Department is developing innovative energy sources for soldier power and for forward-deployed locations, while also striving to find sources of**

renewable energy and meet goals for energy efficiency on installations at home.

Management is vital because the Department of Defense spends billions of dollars every year on energy. The Department's request for 2009 includes \$3 billion more for energy than last fiscal year.

This week, the price of oil topped \$109 per barrel and is four times more expensive than it was in 2001.

Increased fuel prices strain the Military Services' readiness accounts. For example, in fiscal year 2009, roughly half of the increase in the Navy's Operations and Maintenance budget request is due to projected increases in fuel costs.



**For the past several years, the Defense Energy Supply Center raised bulk fuel rates mid-year, charging the Services more than they budgeted for fuel.**

**In many ways, the Department has already assumed a leadership role in addressing energy demand challenges.**

**For example, even before the National Defense Authorization Act for Fiscal Year 2007 required it, the Department of Defense already had established an internal goal of using 25 percent renewable electricity by 2025.**

**The Services are also implementing innovative energy projects.**

**For example, at Nellis Air Force Base, the Air Force has partnered with private industry to build the**

largest solar panel array in the Americas. This was accomplished through an enhanced use lease which allows the installation to lease non-excess land to private entities for 50 years or more.

Other plans for the use of enhanced use leases raise questions, however.

The Air Force is proposing enhanced use lease agreements for a coal-to-liquid production facility at Malmstrom Air Force Base and for nuclear power plants on other Air Force installations.

I am concerned that use of such long-term commitments may impede a base's primary mission and could result in another form of encroachment. I will be very interested to hear whether the Department thinks these proposals serve the overall good for installations.

I also hope to address the criteria we use to evaluate choices that effect energy use. For example, what lessons are being learned from the pilot study using the fully burdened cost of fuel for mobility systems?

Of course, we also are anxious to learn about recommendations by the Defense Science Board and Government Accountability Office, as well as specific energy solutions and challenges from the Department's perspective.

I look forward to thoughtful testimony from the distinguished witnesses we have invited here today on these and other issues of interest to my colleagues on the Subcommittee.

**The Chair now recognizes the distinguished gentleman from Virginia, Mr. Forbes, for any remarks he would like to make.**

**(Mr. Forbes remarks)**

**Today, we have a panel of distinguished witnesses representing the Department of Defense, the Defense Science Board and the Government Accountability Office. We have:**

**Mr. Wayne Arny**

**Deputy Under Secretary of Defense for Installations and Environment**

**Mr. Chris DiPetto**

**Deputy Director of Systems and Software Engineering in the Office of the Under Secretary of Defense for Acquisition and Technology**

**General Michael P. C. Carns, United States Air Force  
(Retired)**

**Chairman of the Defense Science Board Task Force on  
Energy Strategy**

**and**

**Mr. William M. Solis**

**Director of Defense Capabilities and Management  
United States Government Accountability Office**

**Without objection, the witnesses' prepared testimony  
will be accepted for the record.**

**Mr. Army, welcome, you may proceed with your  
opening remarks.**

**(Mr. Army remarks)**

**Mr. DiPetto, you also may proceed with any opening remarks you may have.**

**(Mr DiPetto remarks)**

**General Carns, please proceed with any opening remarks you may have.**

**(General Carns remarks)**

**Mr. Solis, you also may proceed with any opening remarks you may have.**

**(Mr. Solis remarks)**

**Statement of the Congressman Forbes  
Ranking member, Subcommittee on Readiness**

**Hearing on Energy  
March 13, 2008**

**Mr. Chairman, I want to applaud your leadership and foresight in addressing not only the issues that are impacting military readiness today—but also issues that are long-term threats to the readiness of the Department of Defense. Today's hearing on DOD's Energy Posture, and the hearing we had this past Tuesday on Inherently Governmental Functions, address issues that are complex and very often ill-defined. They require a long-range strategy and commitment if we are to have an impact. Yet, they truly are issues that define and underpin the readiness posture of the department. Thank you for your vision and thank you for holding this hearing.**

I would also like to thank you for assembling this terrific panel of witnesses. Gentlemen - thank you for taking the time to talk with us today. We appreciate your expertise on this matter and we value your time.

Today, we have an opportunity to look at a wide variety of issues related to the energy requirements and the energy posture of the Department of Defense. The recently released Defense Science Board study on DOD's Energy Strategy provides a solid backdrop for our conversation. The findings and recommendations in this report are important and timely. With the rising price of crude oil, one might even argue that they are overdue.

We are honored to have one of the study's co-chairman with us today...General Michael Carns (retired). General, my thanks to you and all the members of the task force for the



work you have done in examining the Department's energy challenges.

One of the goals of the hearing today is to discuss the two serious energy risk areas that are identified in your report—energy risks to our operational forces and the risks of extended loss of power at fixed installations. As you proceed with your testimony, I'd ask each of you to also address what you believe needs to be done so that we can actually see real benefit from the study.

I say that because we study and report on things all the time, yet it is very difficult to bring about real change. Mr. Solis--you probably understand this point better than any of us! I know the committee has kept you very busy and we certainly appreciate all you do to support Congress.

I make this point because we can not afford to have, what I believe are very salient and very plausible recommendations, be put on a shelf and forgotten. I'd like to know what needs to be done to bring your recommendations to fruition so that we can take steps necessary to further strengthen DOD's energy posture and therefore strengthen our national defense. I'm very interested in understanding how the DSB study will inform the strategic plans of the Department and how such strategic plans will be developed and implemented.

I'd also ask that you let us know if there are legislative changes that are needed to improve DOD's energy posture. Oftentimes, energy legislation, such as the Energy Independence and Security Act of 2007, is written with a broad focus across the government. While I agree that the US government's energy policy should be just that - government wide - the Department of Defense has unique

mission-sets, a unique structure, and unique operating requirements. We must take care to ensure that legislation that has all the best intentions does not have unintended consequences that unduly degrade military capability.

Once again, thank you for joining us today. I look forward to your testimony and to gaining a better understanding of what we need to do to ensure military readiness through a strong energy posture.

**HOLD UNTIL RELEASED  
BY THE COMMITTEE**

**STATEMENT OF**

**MR. WAYNE ARNY  
DEPUTY UNDER SECRETARY OF DEFENSE  
(INSTALLATIONS AND ENVIRONMENT)**

**BEFORE THE SUBCOMMITTEE ON  
READINESS**

**OF THE  
HOUSE ARMED SERVICES COMMITTEE**

**MARCH 13, 2008**

## INTRODUCTION

Chairman Ortiz, Congressman Forbes and distinguished members. I appreciate this opportunity to appear before you today to discuss the Department's installation energy efficiency and conservation efforts.

Installations are a critical component of our defense capabilities, directly affecting training, readiness, and quality of life. Besides maintaining the quality of our facilities, it is imperative for the Department to exercise good stewardship of our utilization of natural resources, not only because of the environmental impact, but also because there is a sound business case for minimizing the expenditure of these resources. As such, the Department is committed to reducing energy consumption, managing demand, and investing in energy savings initiatives.

As the Deputy Under Secretary of Defense for Installations and Environment, I have responsibility for policy and oversight of the Department's installation and non-tactical vehicle energy consumption. This represents almost 28 percent of the total energy consumption for the Department (25.2 percent for facilities and 1.5 percent for non-tactical vehicles). I am happy to report that for Fiscal Year 2007, facilities energy utilization decreased by 10.1 percent on a British Thermal Units (BTU) per square foot basis from the 2003 baseline, with a cost savings of \$80 million.

### **Policy and Legislative Guidance**

The Department's energy effort is built upon a strategy that seeks to optimize management by conserving energy and water usage, and improving energy flexibility by

taking advantage of restructured energy commodities markets when opportunities present themselves. In doing so, we are guided by the provisions and goals of the Energy Policy Act of 2005, the recent enactment of chapter 173 (Energy Security) of title 10, U.S.C and Executive Order 13423. On January 24, 2007, President George W. Bush signed Executive Order (E.O.) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" to demonstrate leadership by the Federal Government in environmental and energy areas. It directs agencies to take action in a wide array of functional management areas including energy efficiency, water conservation, green procurement, toxics reduction, recycling, renewable energy, sustainable buildings, electronic stewardship, and fleet fuel efficiency. The Department is addressing the requirements through the establishment of our Implementing Executive Steering Committee, while leveraging our existing environmental management system efforts at installations world wide. We are committed to develop policies, guidance, and metrics to measure progress toward meeting these requirements as demonstrated by our recent development of a Toxic Chemicals and Hazardous Reduction Plan, which was submitted to the Office of the Federal Environment Executive on February 1, 2008. Further, the recently passed Energy Independence and Security Act of 2007 (EISA 2007) also contains a number of new requirements, which the Department is currently examining for implementation.

**Energy Efficiency and Construction**

In January 2006, the Department joined 16 other Federal agencies in signing a Memorandum of Understanding (MOU) for Federal Leadership in High Performance and

Sustainable Buildings. The “sustainable design” effort is guided by principles defined in the MOU that require the employment of integrated design principles, optimized energy performance, protection and conservation of water, enhancement of indoor environmental quality, and reduction of the environmental impact of materials in order to minimize energy and resource consumption and use environmentally preferred products and materials. Sustainable design has the potential to significantly reduce energy consumption. The Department is committed to incorporate sustainable design principles through a comprehensive approach to infrastructure management. Along this line, we are pursuing the attainment of the silver level of the Leadership in Energy and Environmental Design (LEED) program as a goal for 70 percent of the Fiscal Year 2009 Military Construction projects. In addition, the Department is working to assess and address existing facilities’ sustainable practices

Aside from construction of new facilities, we continue to invest in initiatives to improve efficiency in existing structures through the use of Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs) which enable more cost effective long-term facilities operation and maintenance with no up-front costs. The Department is also exploring additional enhanced-use leasing opportunities and public/private ventures to develop cost effective renewable energy sources.

#### **Energy Efficiency on Installations**

The Department’s efforts to conserve energy are yielding significant benefits. As stated above, in Fiscal Year 2007 military installations reduced consumption by 10.1

percent from the 2003 baseline, exceeding the energy conservation goal of six percent. Energy conservation projects accomplished through Energy Savings Performance Contracts (ESPCs) typically account for more than half of all facility energy savings. An ESPC does not require up front capitalization by DoD, but rather is paid for through energy savings. By 2005, the Department reduced facilities energy use by 28.3 percent from the 1985 baseline (measured by energy use per square foot). The Energy Policy Act of 2005, Executive Order 13423, and EISA 2007 combined to reset the baseline and increased the target reductions. As previously stated, facilities energy utilization decreased by 10.1 percent through 2007.

**Renewable Energy.**

The Department is in the forefront of federal agencies in its use of renewable energy and has significantly increased its focus on purchasing renewable energy and developing renewable resources on military installations. While renewable energy projects are consistently more expensive than similar conventional energy sources, which can limit opportunities that are life cycle cost effective, we are working toward a goal established by my predecessor in 2005 to procure or produce renewable energy equivalent to 25 percent of the total electricity demand by 2025. The National Defense Authorization Act of 2007 restated this same goal for the Department. To that end, the Department has increased the use of Energy Conservation Investment Program (ECIP) funds for renewable energy projects from \$5 million in Fiscal Year 2003 to over \$40 million out of the \$80 million proposed Fiscal Year 2009 ECIP budget. Plans call for



ECIP to increase \$10 million per year, up to \$120 million in FY 2013, and renewable energy projects will continue to be a high priority. These projects have produced an historical average savings of \$2.44 for every dollar invested. Further, the Department exceeded the Energy Policy Act of 2005 renewable energy goal of 3 percent in Fiscal Year 2007, achieving 5.5 percent. The Department's total renewable energy produced and procured accounted for 11.9 percent of all electricity use, which places on a glide path to the 25 percent goal by 2025.

While the Department purchases some of its "green energy" locally, there are a number of base-level renewable projects that are very cost effective. One example is the 270-megawatt geothermal power plant at the Navy's facility at China Lake, California. This plant provides enough energy to operate the entire base. The Navy is constructing a second plant at Naval Air Station Fallon in Nevada. Three additional plants are planned in the southwest, two in California at the Naval Air Facility, El Centro and the Marine Corps Air Ground Combat Center at 29 Palms, and one at Chocolate Mountain aerial gunnery range at Marine Corps Air Station, Yuma, Arizona. The Army is also pursuing geothermal at Hawthorn Army Depot in Nevada. In addition, there are several wind-powered facilities operating at a variety of locations that include Naval Base Coronado, San Clemente Island California; FE Warren Air Force Base, Wyoming; Ascension Island; and many additional projects are under consideration. The Department has multiple solar facilities and initiatives at several locations, including bases in California, Texas, and Arizona; and North America's largest solar array, which recently began energy production at Nellis Air Force Base, Nevada. This renewable source provides one third

of the base's requirement by generating 14 megawatts of electricity. This project was accomplished through an innovative power purchase agreement, with no up-front cost to the Air Force and with significantly lower electric rates for the foreseeable future.

Next week, there will be a Pacific Region Energy Forum, focused on Hawaii, but applicable to the entire region. Personnel from all branches of the Department, as well as the Department of Energy, General Services Administration, Pacific Northwest National Lab, the National Renewable Energy Lab, the State of Hawaii, and multiple private sector companies will participate. This event is indicative of the push to integrate and accelerate the development of renewable resources in the region through partnerships with multiple interested parties.

The Department continues to pursue innovative renewable energy technologies. For instance, the Navy has funded a Small Business Innovative Research (SBIR) project for an Ocean Thermal Energy Conversion (OTEC) program. OTEC is being tested at Diego Garcia Naval Base in the Indian Ocean. The OTEC project seeks to use temperature differences between the ocean surface and deeper water to produce electricity. While it is still too early to determine how effective OTEC will be, it demonstrates the Department's interest in exploring and funding innovative renewable energy concepts. The Department has begun investing a portion of the ECIP budget into emerging technology demonstration projects by leveraging funding from the Environmental Security Technology Certification Program (ESTCP). By combining funding from these two programs, both can accomplish stated goals more effectively.

The programs collaborated on four specific projects in Fiscal Year 2008, with similar results expected in Fiscal Year 2009. The demand for renewable energy technology should increase its usage, driving its price down.

The Department recently entered into a strategic partnership with the Department of Energy (DoE) on Energy Efficiency and Renewable Energy, coordinating on three related programs. The first is development of a planning process for net zero installations for the future. A net zero installation would produce at least as much energy as it consumes. DoE provides expertise from the National Laboratories to conduct energy audits of specified installations in order to map areas for efficiency and potential sources for renewable energy. Test sites will be used to develop a planning process and then additional test sites will be used to validate the process. The partnership is also working to simplify and add transparency to the alternative energy financing process. Currently, alternative energy projects take too long to develop and are very complicated to implement. The working group is attempting to develop methods for overcoming these hurdles. A third working group is developing methods for the research organizations within DoD and DoE to better share information and deploy promising technologies throughout both organizations.

**Non-tactical Vehicles**

The Energy Policy Act of 2005, Executive Order 13423, and EISA 2007, all contain provisions relating to management of non-tactical vehicle fleets. The Department has exceeded legislative requirements to use alternative and flexible fuel vehicles of least

75 percent of new vehicles in metropolitan service areas, but has not seen development of alternative fuel infrastructure from which to fuel those vehicles. Though the consumption of alternative fuel increased 12.9 percent in Fiscal Year 2007, it amounted to only 3.2 percent of the total fleet consumption. This is in large part due to a lack of infrastructure to fuel the vehicles. During the same period, consumption of petroleum decreased 5.4 percent, well exceeding the required 2 percent as specified in Executive Order 13423. We are investigating innovative methods for providing alternative fuel infrastructure in the future, including partnerships with the Army and Air Force Exchange Service and private sector suppliers in areas with a concentration of flexible fuel vehicles. The Department anticipates working with other agencies to implement sections of EISA 2007 that will allow our existing programs of replacing standard cars with neighborhood electric vehicles to assist the Department in meeting alternative fuel goals.

**Legislation Related to Installation Energy Management**

With ESPCE authority permanently reauthorized in EISA 2007, the Department has launched an aggressive awareness campaign and is well on its way to meeting the energy reduction requirements under EISA 2007. Though the Department remained on track for achieving energy reduction goals, use of ESPCs declined in 2007. As a result, my office issued a policy memorandum requiring components to provide a plan in future Annual Energy Reports for use of ESPC as a tool in the reduction effort.

The EISA 2007 contains provisions which are being carefully evaluated by the Department. Of particular concern is the requirement to deploy energy managers at most facilities to perform annual energy audits on 25 percent of the infrastructure which is a challenge in the midst of a budget year. Recently the Department has begun to rely on contracted Resource Efficiency Managers at many installations to perform such tasks. It will be difficult to develop the contract vehicles or hire new employees and implement the required programs in the time frame allowed.

EISA 2007 also requires a reduction of fossil fuel use in new and renovated buildings of 55 percent in 2010, increasing to 100 percent in 2030. The Department is concerned that the technology is not currently available to decrease consumption intensity by these levels and some locations will not have sufficient renewable resources to make up the difference. Since project development is already well underway for facilities in the Fiscal Year 2010 Military Construction (MILCON) program, reaching these milestones presents a significant challenge.

### **CONCLUSION**

In closing, I thank you for this opportunity to highlight the Department's energy management of our installations and non-tactical vehicle fleet, our successes and our plans for the future. Your support of the Department's energy initiatives and investments is greatly appreciated, and I look forward to continuing to work with this Committee as we increase energy security and reduce operating costs for the Department.

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HOUSE COMMITTEE  
ON ARMED SERVICES**

**TESTIMONY OF**

**CHRIS DIPETTO**

**OFFICE OF THE DEPUTY UNDER SECRETARY OF DEFENSE  
(ACQUISITION & TECHNOLOGY)**

**BEFORE THE UNITED STATES HOUSE  
COMMITTEE ON ARMED SERVICES  
READINESS SUBCOMMITTEE**

**March 13, 2008**

**FOR OFFICIAL USE ONLY  
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HOUSE COMMITTEE  
ON ARMED SERVICES**

Chairman Ortiz, Congressman Forbes, distinguished members of the Subcommittee:

Thank you for the opportunity to appear before you today to discuss some of the Department of Defense's current efforts to address our energy risks and our energy governance. The past year has been quite active as the enterprise has begun to appreciate the challenges and potential opportunities related to energy.

My name is Chris DiPetto and I am here representing Deputy Under Secretary of Defense (Acquisition & Technology) (A&T), Dr. James Finley. A&T has some specific responsibilities related to examining and setting policy on DoD mobile systems energy. Specifically, we were directed by the Deputy Secretary to mature and incorporate a concept called the "Fully Burdened Cost of Fuel" (FBCF) into DoD business processes. Incorporation of this concept, we believe, will give energy, particularly the burdens of battlespace delivered fuel, proper consideration as we design, develop and acquire capabilities.

The DoD Energy Security Task Force is chaired by Under Secretary of Defense for Acquisition, Technology and Logistics, the Honorable John J. Young. This task force was chartered in May 2006 to delve into the unique energy challenges the Department faces and to develop management and technology solutions. This group has succeeded in raising the profile of energy within the Department and is positioned to provide the senior leadership with actionable recommendations this year on how to manage these energy risks in new and innovative ways. The Office of the Director, Defense Research and

Engineering provides the day-to-day leadership to the Energy Security Task Force, so I defer to them to provide the committee a broader description of its work plan and successes to date. However, A&T participates actively in this group along with other OSD, Joint Staff, Service and Defense Agency representatives.

Today I will provide you some background on energy challenges the Department faces, some work my leadership and I are doing to better understand the Department's energy risk, and some planning and business processes changes the Department is considering to better manage these risks.

#### **Background**

Historically, the Department has treated energy, whether from petroleum-based fuels or electricity, as a cheap commodity, reliably supplied by our highly professional and capable logistics community, via our air tankers, our tanker trucks, our Navy oilers and our installation engineers. The quickly escalating retail price of petroleum-based fuels, the operational risks our supply lines face in our on-going operations, the growing appreciation of installations' energy savings opportunities, and the recognition of the vulnerability of grid-supplied power have all conspired to raise awareness of the energy risks we face. It is for these reasons that the Defense Science Board (DSB) Task Force, chaired by Dr. Schlesinger and General Carns, was commissioned and the DoD Energy Security Task Force was stood up by the Deputy Secretary in late 2006. An earlier Defense Science Board study in 2001 first raised this concern that the Department does



not address the energy-related variables properly in our force planning, requirements development or acquisition process. This more recent DSB Task Force was commissioned, in part, to revisit the 2001 assessment.

My role, supporting the DoD Energy Security Task Force and in response to direction from the Deputy Secretary's Advisory Working Group (DAWG), is to mature and apply an analytic construct for the "Fully Burdened Cost of Fuel" to the Department's myriad business processes affected by fuel. This is an idea quite familiar to any business with transportation assets. The idea is that strategic planning and long-term costing should include not only the price one pays for fuel at the pump, but also all of the logistics effort (equipment depreciation and replacement, personnel, force protection, etc.) it takes to deliver the fuel to the location needed. This concept can be applied meaningfully in the Department's force planning, requirements, acquisition and the science and technology investment and prioritization processes. The utility of this approach is purely analytic in nature. This will not affect DoD accounting systems. We are merely trying to have those organizations considering and building the capabilities we determine we need to be informed of the logistics consequences of their choices.

Our immediate focus on the Fully Burdened Cost of Fuel is to mature the methodology, learn from recent Service experiences and our three pilot programs, add it to relevant DoD guidance, and seek applications in earlier phases of DoD capability development processes. This concept was explained in some detail in the recent Defense

Science Board task force report and in the GAO's recent report (Defense Management: Overarching Organizational Framework Needed to Guide and Oversee Energy Reduction Efforts for Military Operations – GAO-08-426). I will explain the thesis behind the Fully Burdened Cost of Fuel construct in greater detail later in my comments.

One thing that has become clear through A&T's work on energy is that DoD processes need to reconsider our risks and opportunities related to energy. From an operational perspective, our current and future forces face serious challenges from opponents who are smart enough to try to avoid contact with our combat forces and to concentrate on our large logistics tail. Our recent experiences with irregular warfare have provided some hard-earned lessons on this front. Emerging challenges from long-range cruise and ballistic missiles also pose growing complication to our fuel logistics forces. Hence, we were directed to examine the Department's capability development process to identify how we can mitigate our forces' fuel demand and channel investments in energy efficiency, or as we say, energy productivity, more effectively.

The core principle we identified early on, as both the 2001 and 2008 Defense Science Board Energy Task Force reports stated, is that DoD force planning processes do not appreciate what the value is of investing a given dollar into raising the energy efficiency of the force. There is no clear demand signal from commanders, force planners or requirements developers as to the value of the energy our platforms and our forces burn. Its value is infinite when it is not there, but it is treated as a "public good" as

an economist would put it, when it is there. Hence, we don't have good data to understand what it may be worth to the force, in the present or in the long-term, to be more fuel efficient.

Occasionally, a request does come into the Pentagon from the field, as one did from Major General Zilmer, the former commander of US forces in Al Anbar province in Iraq in 2006 that punctuates this challenge. MajGen Zilmer issued a Joint Urgent Operational Need (JUON) statement to the Joint Staff requesting sustainable energy equipment for his forward operating bases. This request was sparked by the general's recognition of the vulnerability of the fuel convoys delivering fuel to his generators. That vulnerability was threatening his operational mission success by delaying resupply. Further, combat forces had to be taken off of offensive missions and placed in force protection roles for the fuel trucks. The Army, in particular, has done an impressive job meeting such urgent needs statements, particularly in devising energy-saving solutions to reduce demand in the field. However, this is a short-term fix that fails to address the long-term vulnerability and deep reliance of our forces on fuel resupply during and between missions, today and into the future. Based on the assessment of the Defense Science Board Task Force and other analyses, we know there is a great deal of energy risk that is not evident to our planning processes and cannot be addressed after systems are fielded.

**DoD Energy Security Strategic Plan**

Recent DoD strategic planning guidance directed the internal Energy Security Task Force to provide the DAWG a DoD Energy Security Strategic Plan this spring. This product is intended to do three things: 1) to provide our senior leadership a deeper appreciation of the broad, cross-cutting implications of operational fuel demand and to drive to a common vision; 2) to provide recommended courses of action to reduce the Department's energy risk; and 3) to perhaps show some leadership within the Interagency to raise issues with broader relevance for discussion. Once this Strategic Plan is completed, is briefed to the DAWG, and the Deputy Secretary's guidance is handed down, we expect to have a deliberate, actionable plan to begin to address DoD's energy risk.

Department business processes, planning processes, governance and a variety of other energy-related issues will be addressed in this Strategic Plan. It is premature for me or any other Department representative to discuss any specifics at this time because it is in draft and has not been aired to any DoD senior leaders. The Strategic Plan's priorities, workplan and responsibilities are being worked out as we speak. However, I can say the Department is considering the recommendations of the Defense Science Board Task Force, the Government Accountability Office report, other recent studies and analyses, and internal assessment and lessons learned from on-going operations in formulating the Plan.

**Fully Burdened Cost of Fuel Thesis and Methodology**

Our work on the Fully Burdened Cost of Fuel is focused on gaining two types of insights for decision-makers at all levels of DoD, as well as for the industries that supply our operational systems). First, we want to understand the magnitude of our operational risk from our huge fuel demand so we will better understand what its worth to make our operational systems more energy efficient and to reduce our resupply risk. The sustainment rate of our forces in operations is a major limiting factor in our operational tempo. Fuel, ammunition, food and water and spare parts resupply are all factors. We are focusing on fuel, though related work is going on in the logistics community all the time to ease the flow of these other assets. Gaining insights on fuel may allow some investment to move from logistics force structure (the “tail”) to combat forces (the “tooth”) in the future force as a result of reduced operational fuel demand.

Second, from a pure cost perspective, early indications from our “Fully Burdened Cost of Fuel” analyses show that the science and technology and acquisition tradespace would open up significantly if we properly valued the financial costs of delivering fuel to the operator. Technologies that are cost prohibitive (on a life cycle costing basis) at \$3.04 a gallon for JP-8 military grade fuel may suddenly look like a bargain at \$42 a gallon, which is the fully burdened price for JP-8 coming from a tanker aircraft, including the depreciation of those assets. This figure is a little old, but it was validated by the 2001 DSB Energy Task Force as well as studies performed by the Logistics Management Institute, the JASONs (an expert DoD scientific advisory body) and the Institute for

Defense Analyses. What does \$42 a gallon mean to DoD? This price tells us it is worth thinking differently about investing to reduce the energy demand of the force. In some cases, we may reconsider the mix of platform types we need and their numbers. For the most part though, we think it tells us we should invest more heavily in lighter weight materials, perhaps spend more on more efficient engines, and perhaps consider taking schedule risk to wait for technologies to mature. Even the development of more energetic fuels would be informed by such analysis. Energy demand would continue to be one of dozens of variables in the tradespace, but it would become more visible and accurately valued.

This approach is not predicated on the idea that energy factors should trump any other individual factor in making decisions in designing systems for our warfighters. To the contrary, the intent is just to raise the value of fuel up in the tradespace from its inaccurate, traditional value (only at the commodity price) to one more representative of its impact on operations and force planning.

Once the methodologies for calculating the FBCF have been vetted for land, sea and air capabilities, we anticipate working with the Joint Staff and the logistics community in using this work as the basis for setting the value and methods of the Energy Efficiency Key Performance Parameter (KPP), currently in the Chairman of the Joint Chiefs of Staff Instruction 3170. As you may know, a KPP for a given DoD program represents an operational quality that a system must maintain in its design to

allow the program to proceed to the next acquisition milestone and through to fielding. In 2007, the Joint Requirements Oversight Council (JROC) directed that energy should be considered as a KPP and the analytic work needed to employ it in the tradespace analyses is currently underway. By implementing the FBCF in a broader set of DoD business processes, and by adding fuel logistics forces into the joint DoD scenario-based force planning process in a more meaningful way, we anticipate developing an understanding of how to set targets and thresholds for this KPP.

#### **Fully Burdened Cost of Fuel – Pilot Programs**

In April 2007, Under Secretary of Defense for Acquisition, Technology and Logistics issued a policy memo to examine three pilot acquisition programs for how they considered fuel within their tradespace, each at varying phases of their development. The purpose of this examination was to provide insights on how real programs consider fuel and to inform the methodology or methodologies for applying the fully burdened cost of fuel to the long-term costing of operations and sustainment (specifically for fuel) for major defense acquisition programs. The pilot programs identified were: 1) the Joint Light Tactical Vehicle (JLTV), a joint Army-Marine Corps land program; 2) the Air Force's next generation long-range strike program (Next Generation Bomber, or NGB); and 3) the Navy's CG(X), or next generation cruiser.

Each of the three pilot programs was at a different phase of acquisition when the April 2007 memorandum was released, and each has considered the impact of fuel

demand and its required logistics in different ways. One thing that has become apparent already is that a number of relevant constraints that affect fuel demand and logistics demand have typically been set for a given program well before an Analysis of Alternatives is formally conducted in the requirements (i.e. JCIDS - Joint Capability Integration and Development System) phase. This finding reinforces the need to better examine fuel supply and demand risks and alternatives in the force planning process, prior to requirements-setting.

A lessons-learned document based on our pilot program experience and discussion will be available at the end of this fiscal year. The recommendations will inform further policy change options for the DoD acquisition system as well as provide necessary tools to future programs to take the FBCF into account. One thing we can safely say today is that there is no one methodology that applies to all systems or capabilities. However, the core variables we should consider in assessing the fully burdened cost of fuel will not change. Fuel commodity cost, the cost of the logistics tail, and the cost of force protection will all remain. The challenge will be in writing flexible guidance to a diverse range of experts, from force planners, requirements developers, systems engineers, program managers and contracting officers that will be applicable to a wide range of materiel solutions.

#### **Energy and the Force**



One does not have to think for too long to figure out that energy is one of a small number of core assets the US military absolutely requires to function. What food and water are to our personnel, fuel and electrical power are to our equipment and installations. Energy demands must be accommodated in almost every aspect of our planning, from powering a Forward Operating Base to considering the refueling requirements of our units in the field. Despite this deep reliance we've built on energy for our military capabilities over the past ninety or more years, much of our force planning still treats fuel like oxygen, a commodity that will be available at the time and place of our choosing. Obviously, conditions in the field are seldom that cut and dry, so our operational planners and field commanders put much more of their time and attention into ensuring fuel is delivered where needed, when needed. This dichotomy between DoD force planning and operational planning is a fissure we're just beginning to come to grips with.

I will reinforce a comparison the Defense Science Board Task Force made. One major reason for the high professional quality of our warfighters compared to those from many other countries is that we invest a great deal to train like we fight. We build and maintain great ranges and urban operations training facilities, and we train jointly and globally, often with partners. Fuel logistics for those exercises are planned as key enablers and fuel costs are covered or else the training does not happen. However, when we design our future capabilities in the Pentagon or at the major Service materiel commands and elsewhere, logistics demand of our capability choices are not addressed

until after we have decided on what performance our platforms or combat units should have. Stated more simply, our force planning processes almost always plug fuel logistics in at the back end, after the capability we want is designed. The result is that we plan capabilities and systems ignorant to the combat support “tail” we are creating. That has negative implications for the total force, as well as for the platform or unit we’ve designed for the “tooth”. Further, we make decisions on the unrefueled range and payload and loiter time of platform types, but at no point does the force development processes consider whether it’s worth it to reduce the logistics demand to gain unit or theater deployability, vulnerability or sustainability benefits. Finally, we have little to no analysis on which to determine what its worth to the larger force to invest in fuel efficiency technologies. We’re largely allocating investment based on military or technical experience, not on modeling, wargaming, trend analysis or other accepted tools.

Some of the negative results of this approach are: a shifting of mission risk to the combat support forces, which have less ability to shape (or survive) their battlespace than combat forces, a lack of focus on the costs to the enterprise from fuel and fuel logistics force growth, and a resulting opportunity cost through reduced resources for combat forces (trigger-pullers) and combat force development.

The good news is that the Department leadership, as it becomes better informed on these cross-cutting energy issues, is beginning to test and implement a number process

changes that will help us better manage our energy demand and spur innovation in how we build our capabilities.

While A&T's focus is on understanding and mitigating the energy demand of mobile forces, there is also a supply and demand aspect to this challenge that other communities, like Science and Technology, Logistics, and Installations and Environment are addressing. Many other parts of the Department are doing important, interesting work to address supply-side and demand-side challenges, but those are best explained by the Components or by the Energy Security Task Force leadership.

Dr. Finley and I appreciate your attention on these critical energy management issues facing the Department. We look forward to the Committee's support of these practical management and strategic planning process changes to reduce the energy burden on our forces.

**TESTIMONY OF GEN MICHAEL P.C. CARNS  
BEFORE THE READINESS SUBCOMMITTEE  
OF THE HOUSE ARMED SERVICES COMMITTEE**

March 13, 2008

**THE 2008 DEFENSE SCIENCE BOARD REPORT ON DOD ENERGY STRATEGY –  
“MORE FIGHT – LESS FUEL”**

Chairman Ortiz, Distinguished members of the Readiness Subcommittee. In May 2006, the Under Secretary of Defense for Acquisition, Logistics and Technology, Ken Krieg, commissioned a Defense Science Board Task Force on DoD Energy Strategy. Citing significant energy security risks to both our nation and our military forces, he challenged the Task Force to find opportunities to reduce DoD's energy demand, identify institutional obstacles to their implementation, and assess their potential commercial and security benefits to the nation.

**About the Task Force**

The Task Force was co-chaired by Dr. James Schlesinger and me. Over a 10 month period from May 2006 to March 2007, 77 Task Force members and government advisors spent conducted 37 meetings, heard 143 briefings, examined a large number of related studies conducted by others, and held many discussions to collect and synthesize information. We spent the following 10 months analyzing the information we collected to extract what we have concluded to be the root causes of the problem and formulate our recommendations on the best approach to identifying the most workable remedies. I request that the report be entered into the record.

The task force examined DoD energy demand and consumption patterns by end use, by energy type, and by geographic location; and dug deep into the details of DoD's internal business processes to understand what factors lead to decisions that either directly or indirectly drive DoD's energy use patterns. We examined both supply and demand issues and using risk management principals, identified core problems and proposed remedies that are most likely to address the systemic causes of DoD's energy challenges.

**DoD's Energy Posture**

The Task Force found that the Department of Defense is the largest single consumer of energy in the United States. In 2006, it spent \$13.6 billion to buy 110 million barrels of petroleum fuel (over 300,000 barrels of oil each day), and 3.8 billion kWh of electricity. This is about 0.8% of total U.S. energy consumption, over 1.5% of petroleum, and 78% of total energy consumption by the Federal government. Buildings and facilities account for about 25% of the Department's total energy use, with combat and combat support systems using the rest.

But while DoD is the single largest user of energy in the nation, its requirement is small relative to the total market. DoD's recent wartime petroleum consumption is not a lot larger than a major international airline. The Defense Energy Support Center (DESC) maintains a robust global network of supply points and sources for all types of DoD fuels, and has contracts with refineries strategically located around the world. In addition, if needed for national security, DoD could exercise eminent domain over commercial energy contracts. Because of this, the Task Force finds it difficult to imagine a scenario where DoD would be unable to obtain the commercial supplies of petroleum it needs to perform its mission.

So while commercial availability of petroleum for DoD is not a problem in the foreseeable future, the Task Force concluded that DoD faces two serious energy risks: high energy demands of our operational forces, primarily fuel; and high risk of extended loss of commercial power to some critical missions at our fixed installations.

#### Energy Risks to Operational Forces

Moving fuel to deployed forces is difficult, expensive and dangerous. Logistics is a vulnerable soft underbelly for us; and a target rich environment for our enemies. The larger our logistics tail gets, the more difficult it is to protect, and more combat power we must divert from combat operations to assure its safety, and the more casualties we take because our supply trucks can never be as survivable as our combat vehicles.

This problem was best expressed by then Maj Gen. James T. Mattis, who in 2003 was Commanding General, 1st Marine Division in Operation Iraqi Freedom. He said "Unleash us from the tether of fuel." Our Task Force concurs with his assessment of the problem.

When Marine Corps Maj. Gen. Richard Zilmer commanded al-Anbar province, he submitted a "priority 1" Joint Staff Rapid Validation and Resourcing Request asking for renewable energy to reduce the need for fuel so he could decrease the logistics convoys on the road, thereby reducing the danger to our Marines, soldiers, and sailors. As it turned out, improving the efficiency of deployed systems contributed more to reducing fuel demand than renewable energy sources.

#### Addressing Energy Risks to Operational Forces

The best way to reduce energy risks to operational forces is to reduce their demand for energy. The prescription for this was written in 2001 by another Defense Science Board Task Force. It noted that key decisions within the Department that drove operational fuel demand were not accurately informed about their energy consequences, and that investment decisions to improve fuel efficiency were not based on accurate data. This situation has not changed today.

We reiterate 2 key recommendations made in 2001 to address this problem:

- a Key Performance Parameter (KPP) for all new systems that would limit the amount of fuel a system could demand across the suite of scenarios DoD envisioned it being used, and
- the “Fully Burdened Cost of Fuel” to capture the costs associated with moving fuel from its point of commercial purchase to its ultimate point of use.

The Task Force congratulates the the Joint Staff (JS) and Office of the Secretary of Defense (OSD) for two recent policies that implem the 2001 Task Force recommendations:

- An August 17, 2006, Vice Chairman of the Joint Chiefs of Staff (VCJCS) memorandum (JROCM 161-06) endorsing a Joint Requirements Oversight Council (JROC) decision to establish an Energy Efficiency Key Performance Parameter (KPP).
- An April 10, 2007 USD(AT&L) memorandum establishing Department policy to use the “fully burdened cost of fuel” (FBCF) for all acquisition trade analyses.

These factors will inform investment decisions in technologies that reduce a systems fuel demand. The For example, by the time a gallon of fuel gets through to the end of a boom on an aerial refueling aircraft, the Air Force has spent about \$42 to get it there. The fully burdened cost of fuel is intended to answer the question “what is it worth to reduce the fuel demand of the aircraft that receive fuel from aerial refuelers, or the refuelers themselves”? Should the business case based on \$3 per gallon, or \$42 per gallon? The Task Force noted that a technology to reduce fuel demand that looks like a poor investment at \$3 per gallon saved could look pretty good at \$42 per gallon saved.

The Task Force recommends the Department establish a standard means for calculating and maintaining “fully burdened cost of fuel” values and require its use as a factor in all Analyses of Alternatives (AoAs) / Evaluation of Alternatives (EoAs) and throughout all acquisition trades, including the systems engineering process. The Task Force also recommends the Department step up its efforts to implement the energy KPP.

In addition to acquisition programs, the Task Force recommends the Department apply fully burdened cost of fuel to reset programs. On January 26, 2007, the Chief of Staff of the Army testified to the full Committee that the Army has an \$85 Billion reset backlog. Putting energy technologies into the tradespace for reset programs could begin providing near reductions in operational fuel demand.

“Black” programs should not be exempt from these requirements. These requirements should also include non-developmental systems used at forward operating locations such as field kitchens, heating and air conditioning for tents, laundries and the like.

The Foot Soldier

Foot soldiers also consume energy to power the equipment they carry, such as gear for communications, night vision and data. They are the most electronically equipped soldiers in history. While this gives them great capability, it also increases the weight they carry, particularly in the form of the batteries. When designing the energy performance of these systems, the Department should use the fully burdened cost of delivering and protecting battery deliveries to the field.

#### Competitive Prototyping

Warfighters are risk averse when it comes to unproven technologies, and understandably so. You would be too if you relied on them to protect you when you're being shot at. There is value in proving new concepts at scale through competitive prototyping. Doing so will get new energy technologies into the field than would otherwise be the case.

#### Procurement Policy

The Task Force noted that deployed forces order energy using equipment through DLA and GSA. These organizations do not "automatically" providing their customers with the most efficient equipment available, such as those designated by the EPA Energy Star or DoE's FEMP program. The Task Force recommends DLA and GSA comply with Section 104 of the Energy Policy Act of 2005, which states that DLA and GSA offer only Energy Star or FEMP designated products.

#### Operational Procedures

How systems are operated can significantly affect fuel consumption. The Task Force found the Navy's Incentivized Energy Conservation program (i-ENCON) to be an effective tool for incentivizing military personnel and civilian employees to reduce fuel use. This program allows commanders to keep a portion of the money saved through operational efficiency measures they enact, and use it for morale, welfare and recreation or investments in further efficiency measures.

The report also provides a list of directives Services could put in place to reduce unnecessary energy use. They include such things as single engine taxiing, avoid unnecessary use of afterburners, more efficient flight routing, greater use of simulators, better mission planning to minimize the need to dump fuel, use only Energy Star and FEMP designated products, eliminate incandescent lighting at installations, and eliminate requirements for computers to be running 24/7 through better IT management.

To accomplish any of this requires sustained and focused leadership. The Task Force recommends the Deputy Secretary of Defense (DEPSECDEF) and the VCJCS direct all Components to review current practices take advantage of opportunities to reduce energy use. Regular reviews of actions taken and their results across Components will help track progress and validate techniques.

#### The Need for Accurate Data

In addition to policies, procedures and analyses, DoD needs better data on its fuel usage, particularly fuel used by operational forces. The Defense Energy Support Center's data collection was designed for billing purposes. A lack of consumption data makes it difficult to establish baselines and metrics to manage by, or to prioritize efforts toward systems that create the greatest demand.

#### Leadership, Governance and Oversight

The Task Force found that there is no enterprise wide strategy for managing DoD's energy usage, and no one office is in charge. There are few objectives or metrics, and no one is accountable. Decisions that affect DoD's demand for energy cut across the Department and are disconnected from each other organizationally, functionally and culturally. The lowest organizational level at which they all come together is the Deputy Secretary. This is not an effective management model.

#### Final Points About Operational Fuel

The global oil market today is about 86 million barrels per day, of which about 21 million barrels are used in the U.S. DoD uses on the order of 330,000 per day. Further, the Defense Energy Support Center briefed us that DoD has eminent domain over commercial fuel contracts when national security needs create the requirement. As a result, the Task Force found it difficult to imagine a scenario in which DoD would be unable to acquire the fuel it needs to perform its mission from the commercial market.

Since DoD is an expeditionary force, It buys fuel as near to where it fights as possible. Fuel purchased domestically is used primarily for training. As a result, the Task Force concluded that domestically produced synthetic fuel does not contribute to mitigating DoD's most critical energy risk – high operational fuel demand. While the Task Force encourages further research into alternative fuels, it also concluded funds that could be spent supporting full scale production facilities, would accomplish more to reduce DoD's energy risks by exploiting opportunities to reduce demand. The exception to this would be synthetic fuel produced at or near an operating location using locally available feedstocks. This would directly mitigate the operational risks from moving fuel into forward areas. Such a system is currently being tested.

#### Risk to Critical Missions from Extended Power Loss

The Task Force found there are a number of critical missions at fixed installations that are at unacceptable risk of outage from loss of commercial power. In many cases, neither the grid nor on-base backup power provide sufficient reliability to ensure continuity of critical national priority functions and oversight of strategic missions in the face of a long term outage. This finding was based on a series of briefings and discussions we held with Department of Energy, industry and Department of Defense



officials, as well as reports and other open source literature on the operation of the national power grid and the generating equipment that energizes it.

This affects not only DoD, but is central to all facets of the nation's economic life. At around 4:15pm EST on August 14, 2003 a 9,300 square mile area in the U.S. and Canada inhabited by about 50 million people lost electrical power. More than 500 generating units at 265 power plants shut down, 22 of which were nuclear. Those plants took about two weeks to regain full capacity, and lost an average of more than half their capacity for 12 days. The triggering event of the failure was a tree branch falling into a power line. What followed was a series of cascading failures. Some have argued that the August 2003 incident shows that the protections built into the grid worked. Within several hours electricity was restored to many areas, though a few areas waited nearly a week. However, relatively quick restoration was possible because no significant equipment was damaged. That would be different in a deliberate attack. Even so, during the blackout most systems failed that would detect unauthorized border crossings, port landings, or unauthorized access to vulnerable sites. Future such blackouts could be exploited for terrorist activity, with potentially far more catastrophic results.

#### Consequences of Prolonged Outage

In addition to the effect to DoD missions, power failures have a national consequence. To understand this, a quick review of the consequences of the August 2003 outage is instructive. Some areas lost drinking water because pumps or treatment systems or both failed. In at least one case, a chlorine leak at a chemical plant caused by the outage went undetected for nearly a week. Sewage systems failed, causing raw sewage to spill into waterways, including the ocean and rivers. People became sick from consuming unclean water. Rail service was significantly curtailed or stopped completely along Amtrak's northeast corridor, on Long Island and in Canada. Air travel was affected because passenger screening stopped at most airports, electronic ticketing did not work and air traffic could not function reliably. Gas stations closed because they could not pump fuel, hindering not only commutes, but also transportation of goods. Price gouging took place in some instances, and gas lines were reminiscent of those in the 1970s and early 1980s. Many oil refineries on the East Coast shut down. Cellular communications were disrupted because of inadequate backup power at communications towers and because customers could not recharge their phones. This overwhelmed some land line systems, and those with only cordless phones could not recharge them either. A number of television and radio stations went off the air temporarily though many had backup power. Cable television systems stopped broadcasting, some internet service providers were taken down and desktop computers not on backup power did not work. Large numbers of factories closed. And because of the interconnectedness of supply chains, many not directly affected by the outage had to close or slow because of supply problems. Border check systems did not work and truck traffic became severely backed up. This can be a serious economic problem when a "just-in-time" supply system depends on these trucks. Some industries took over a week to return to full production. Also, looting incidents were reported, though

not to the level seen in New York City during the 1977 blackout. Overall, the nation lost output, affected the lives of some 50 million people in the U.S. and Canada, and U.S. national security was compromised.

#### Managing Energy at Installations

At DoD installations, electricity is metered for the purpose of billing by utility companies, but metering within the installation for energy management purposes has been spotty. Policies to meter all buildings are very recent, were directed by Congress, and will be implemented as new buildings are constructed or renovated.

The Task Force was struck by the contrast between the energy demand data collected by DoD and that collected by another very large energy consuming entity – Wal-Mart. If a single freezer cabinet door remains open too long at an individual store, an alarm is triggered at Wal-Mart's headquarters in Bentonville, AR. Wal-Mart uses detailed demand and consumption data to inform corporate wide decisions that affect energy demand including capital investments, maintenance policies and operational procedures.

#### Assessing and Managing Risk

The Task Force was briefed on a number of vulnerability assessments DoD has conducted its installations, but had not developed a risk management strategy to deal with those vulnerabilities. The latter requires broader understanding of the potential impacts on its operations, identifying engineering solutions to reduce risk and a business plan to implement them.

The Task Force recommends the Department form a cross-functional team to assess the risk of specific missions at specific locations.

#### Demand Side Remedies

Reducing demand through higher levels of efficiency reduces the amount of energy necessary to sustain operations. This makes it easier and cheaper for alternative sources to meet the load. The Task Force found there are many opportunities to reduce critical loads at installations. They are described in the report. The Task Force also found the Department's efforts in this area to be modest compared to what can be technically and economically justified.

In addition, the Task Force saw instances where installations have not distinguished between critical and non-critical loads when configuring backup power systems, leaving critical missions competing with non-essential loads for power. These are simple design or installation practices that should be fixed. Backing up smaller loads is easier than large ones.

#### Supply Side Remedies

Supply side approaches involve building resilient local power sources, sized according to the mission load and the duration of an outage the installation is at risk of experiencing. The Task Force recommends DoD pursue the concept of "islanding," which would isolate critical loads, and selectively entire installations, from the grid and make them self-sufficient. A combination of much higher end-use efficiency coupled with alternative power supply sources would move the Department in this direction. The Task Force recommends that DoD collaborate closely in these endeavors with other agencies, especially the DoE and its national laboratories, whose mission is energy research and technology deployment.

The Task Force considered whether it was possible to build net-zero energy capability at critical installations, and found a range of emerging enabling technologies. The concept is based on combining significantly greater end-use efficiency with onsite power generation from renewable sources and distributed generation. The Energy Policy Act of 2005 and Executive Order 13423 already move DoD in this direction by requiring much higher efficiency and greater deployment of renewable energy sources. The Task Force recommends DoD carefully select candidate net-zero energy demonstration installations.

#### Overseas Considerations

What is true for CONUS installations is even more relevant outside the U.S. where commercial systems are often less reliable and less well protected than domestically. Reliability standards vary significantly from country to country and often are not enforced. In some locations, poor maintenance and political or social instability create further risks. Yet DoD conducts little or no planning to cope with long-term blackouts at its OCONUS installations.

#### The Payoff

The payoff to DoD from reduced fuel demand in terms of mission effectiveness and human lives is probably greater than for any other energy user in the world. More efficient platforms would enhance range, persistence and endurance. They also would reduce the burden of owning, employing, operating and protecting the people and equipment needed to move and protect fuel from the point of commercial purchase to the point of use. An important implication is that increased energy efficiency of deployed equipment and systems will have a large multiplier effect. Not only will there be direct savings in fuel cost, but combat effectiveness will be increased and resources otherwise needed for resupply and protection redirected. Truck drivers and convoy-protectors can become combat soldiers, increasing combat capability while reducing vulnerabilities caused by extensive convoys. In short, more efficient platforms increase warfighting capability.

To achieve these outcomes, the Task Force developed the following 6 recommendations.

Recommendation #1: Accelerate efforts to implement energy efficiency Key Performance Parameters (KPPs) and use the Fully Burdened Cost of Fuel (FBCF), to inform all acquisition trades and analyses about their energy consequences, as recommended by the 2001 Task Force.

Recommendation #2: Reduce the risk to critical missions at fixed installations from loss of commercial power and other critical national infrastructure by creating an assessing mission risks and implementing site-specific risk mitigation measures. This will require a joint effort among a number of DoD offices that do not normally undertake joint projects.

Recommendation #3: Establish a Department-wide strategic plan that establishes measurable goals, achieves the business process changes recommended by the 2001 DSB report and establishes clear responsibility and accountability.

Recommendation #4: Invest in energy efficient and alternative energy technologies to a level commensurate with their operational and financial value.

Recommendation #5: Identify and exploit near-term opportunities to reduce energy use through policies and incentives that change operational procedures.

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United States Government Accountability Office

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Testimony

Before the Subcommittee on Readiness,  
Committee on Armed Services, House of  
Representatives

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## DEFENSE MANAGEMENT

### Overarching Organizational Framework Could Improve DOD's Management of Energy Reduction Efforts for Military Operations

Statement of William M. Solis, Director  
Defense Capabilities and Management



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GAO-08-523T

March 13, 2008



Highlights of GAO-08-523T, a testimony before the Subcommittee on Readiness, Committee on Armed Services, House of Representatives

## DEFENSE MANAGEMENT

### Overarching Organizational Framework Could Improve DOD's Management of Energy Reduction Efforts for Military Operations

#### Why GAO Did This Study

The Department of Defense (DOD) is the single largest U.S. energy consumer. About three-fourths of its total consumption consists of mobility energy—the energy required for moving and sustaining its forces and weapons platforms for military operations.

GAO was asked to discuss DOD's efforts to manage and reduce its mobility energy demand. This testimony addresses (1) energy issues that are likely to affect DOD in the future, (2) key departmental and military service efforts to reduce demand for mobility energy, and (3) DOD's management approach to guide and oversee these efforts. This testimony is based primarily on work conducted for a report that GAO issued today (GAO-08-426) on DOD's management of mobility energy.

#### What GAO Recommends

In the report GAO issued today, GAO recommended that DOD establish an overarching organizational framework to improve the department's ability to address mobility energy challenges. The framework should include an executive-level Office of the Secretary of Defense (OSD) official accountable for mobility energy matters, a comprehensive strategic plan, and improvements to DOD's business processes. The military services should designate executive-level focal points to establish effective communication and coordination among OSD and the military services. DOD partially concurred with the recommendations.

To view the full product, click on GAO-08-523T. For more information, contact William M. Solis at (202) 512-8365 or [solisw@gao.gov](mailto:solisw@gao.gov).

#### What GAO Found

Several issues, such as rising fuel costs, worldwide energy demand, and the high fuel burden during operations, underscore the importance of energy to DOD. Fuel costs for DOD are substantial and the volatility of world oil prices will likely continue to affect the department—which may require DOD to make difficult trade-offs such as redirecting funds from ongoing programs to pay for needed fuel. Other energy issues that are likely to affect DOD in the future are the increased U.S. dependence on foreign oil, projected increases in the worldwide demand for oil, and uncertainties about world oil supplies. Furthermore, DOD's high fuel requirements on the battlefield can place a significant logistics burden on military forces, limit the range and pace of operations, and add to mission risks, including exposing supply convoys to attack. Given these issues, DOD must be well positioned to effectively manage energy demands for military operations.

DOD has initiatives under way to reduce mobility energy demand. At the department level, OSD created a task force to address energy security concerns. In addition, the Deputy Secretary of Defense included energy in DOD's list of the top 25 transformational priorities for the department as part of its initiative to pursue targeted acquisition reforms. Each of the military services also has its own initiatives under way. The Army is addressing fuel consumption at forward-deployed locations by developing foam-insulated tents and temporary dome structures that are more efficient to heat and cool, reducing the demand for fuel-powered generators. The Navy has established an energy conservation program to encourage ships to reduce energy consumption. The Air Force has developed an energy strategy and undertaken initiatives to determine fuel-efficient flight routes, reduce the weight on aircraft, optimize air refueling, and improve the efficiency of ground operations. The Marine Corps has initiated research and development efforts to develop alternative power sources, such as hybrid power, and improve fuel management.

While these and other mobility energy reduction efforts are under way, DOD lacks elements of an overarching organizational framework to guide and oversee these efforts. Specifically, GAO found that DOD's current approach to mobility energy lacks (1) a single executive-level OSD official who is accountable for mobility energy matters, (2) a comprehensive strategic plan for mobility energy, and (3) an effective mechanism to provide for communication and coordination of mobility energy efforts among OSD and the military services as well as leadership and accountability over each military service's efforts. GAO also found that DOD has made limited progress in incorporating fuel efficiency as a consideration in key business processes—which include developing requirements for and acquiring new weapons systems. With a mobility energy overarching organizational framework in place, DOD would be better positioned to reduce its significant reliance on petroleum-based fuel and to address the energy challenges of the 21st century.

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Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the Department of Defense's (DOD) efforts to manage and reduce its demand for mobility energy—that is, the energy required for moving and sustaining its forces and weapons platforms for military operations. Mobility energy accounts for about three-fourths of DOD's total energy consumption.<sup>1</sup> U.S. military forces, for example, require vast quantities of fuel to operate combat and support vehicles; generate power at forward-deployed locations; and move troops, equipment, and supplies. As the single largest energy consumer in the United States, DOD incurs billions of dollars each year in fuel costs, and these costs have been rising in recent years as oil prices have increased. DOD recognizes that its high energy demand presents significant risks to its military forces. Moreover, a February 2008 Defense Science Board report concluded that DOD's high fuel demand compromises operational capability and mission success, requires an excessive logistics infrastructure, creates more risk for support operations than necessary, and increases life cycle operations and support costs.<sup>2</sup> In addition, the report notes that changing a culture that considers energy cheap and abundant is one of the most difficult challenges facing the department and the nation.

Today I would like to provide our perspectives on (1) energy issues that are likely to affect DOD in the future, (2) key departmental and military service efforts to reduce demand for mobility energy, and (3) DOD's management approach to guide and oversee these efforts. This statement is based primarily on the work we conducted for a report that we issued today that addresses DOD's management of energy reduction efforts for military operations.<sup>3</sup> As part of this work, we reviewed several DOD-sponsored studies that have recommended actions DOD could take to

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<sup>1</sup>Energy consumed at fixed installations, referred to as facility energy, accounts for most of DOD's remaining energy use.

<sup>2</sup>Defense Science Board Task Force on DOD Energy Strategy, *More Fight—Less Fuel* (February 2008).

<sup>3</sup>GAO, *Defense Management: Overarching Organizational Framework Needed to Guide and Oversee Energy Reduction Efforts for Military Operations*, GAO-08-426 (Washington, D.C.: Mar. 13, 2008).

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better manage its mobility energy challenges.<sup>4</sup> We have also had an opportunity to review the February 2008 Defense Science Board report. We conducted this performance audit from September 2007 through March 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Summary

Several issues, such as rising fuel costs, worldwide energy demand, and the high fuel burden during operations, underscore the importance of energy to DOD. Fuel costs for DOD are substantial and the volatility of world oil prices will likely continue to affect the department—which may require DOD to make difficult trade-offs, such as redirecting funds from ongoing programs to pay for needed fuel. In addition, both the Army and Marine Corps have plans to grow their forces over the next several years, which will inevitably require larger amounts of fuel to sustain these forces and their weapons systems. Other energy issues that are likely to affect DOD in the future are the increased U.S. dependence on foreign oil, projected increases in the worldwide demand for oil, and uncertainties about world oil supplies. Furthermore, DOD's high fuel requirements on the battlefield can place a significant logistics burden on military forces; limit the range and pace of operations; and add to mission risks, including exposing supply convoys to attack. Given these issues, DOD must be well positioned to effectively manage energy demands for military operations.

DOD and the military services have several initiatives under way to reduce demand for mobility energy. At the department level, the Office of the Secretary of Defense (OSD) created a task force in 2006 to address energy security concerns. Moreover, in 2007, the Deputy Secretary of Defense included energy in DOD's list of the top 25 transformational priorities for the department as part of its initiative to pursue targeted acquisition reforms. Each of the military services also has its own initiatives under way to reduce mobility energy demand. The Army is addressing fuel

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<sup>4</sup>Defense Science Board Task Force on Improving Fuel Efficiency of Weapons Platforms, *More Capable Warfighting Through Reduced Fuel Burden* (January 2001). The JASONS, *Reducing DOD Fossil-Fuel Dependence*, JSR-06-135 (September 2006). LMI, *Transforming the Way DOD Looks at Energy: An Approach to Establishing an Energy Strategy*, Report FT602T1 (April 2007).



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consumption at forward-deployed locations by developing foam-insulated tents and temporary dome structures that are more efficient to heat and cool, reducing the demand for fuel-powered generators. The Navy has established an energy conservation program to encourage ships to reduce energy consumption. The Air Force has developed an energy strategy and undertaken initiatives to determine fuel-efficient flight routes, reduce the weight on aircraft, optimize air refueling, and improve the efficiency of ground operations. The Marine Corps has initiated research and development efforts to develop alternative power sources, such as hybrid power, and improve fuel management.

While these and other individual efforts are under way to reduce mobility energy demand, we found that DOD does not have an overarching organizational framework to guide and oversee these efforts. Our prior work has shown that an overarching organizational framework is critical to successful transformation in both public and private organizations. Key elements of such a framework include (1) top-level leadership and an implementation team with dedicated resources and funding; (2) a comprehensive strategic plan that includes goals, objectives, methods, timelines, and outcome-oriented performance metrics; and (3) a communication strategy that provides shared expectations and reports related progress. We found that DOD's current approach to mobility energy lacks these elements. For example, while DOD has begun to increase management attention on energy issues, it has not designated a single executive-level OSD official—supported by an implementation team—who is accountable for mobility energy matters across the department, who participates in top policy-making decisions as an advocate for reducing mobility energy demand, and who serves as a stakeholder in interagency discussions about national energy concerns. Currently, DOD's approach to mobility energy is decentralized, with fuel oversight and management responsibilities diffused among several OSD and military service offices as well as working groups. In addition, until DOD fully develops and implements a comprehensive strategic plan for mobility energy, it cannot be certain that mobility energy reduction efforts align with the department's energy mission or strategic goals to ensure that they are appropriately prioritized or to know whether critical gaps or duplication of efforts exist. Finally, without an effective mechanism to facilitate communication of mobility energy reduction efforts among OSD and the military services, DOD cannot be assured that these efforts are consistent with DOD's energy priorities and goals. We also found that DOD has made limited progress in incorporating fuel efficiency as a consideration in key business processes—which include developing requirements for and acquiring new weapons systems—and in

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implementing recommendations from department-sponsored studies on fuel reduction. With a mobility energy overarching organizational framework in place, DOD would be better positioned to reduce its significant reliance on petroleum-based fuel and to address the energy challenges of the 21st century.

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### Several Issues Underscore Importance of Energy to DOD

Several issues, such as rising fuel costs, worldwide energy demand, and the high fuel burden during operations, underscore the importance of energy to DOD. Fuel costs for DOD are substantial and the volatility of world oil prices will likely continue to affect the department. For example, in fiscal year 2007, DOD reported that it consumed almost 4.8 billion gallons of mobility fuel and spent \$9.5 billion. Although fuel costs represent less than 3 percent of the total DOD budget, they have a significant impact on the department's operating costs. DOD has estimated that for every \$10 increase in the price of a barrel of oil, DOD's operating costs increase by approximately \$1.3 billion. Furthermore, during a 2007 military energy security forum, DOD officials discussed the possibility of oil prices rising to as much as \$200 a barrel if a major disruption were to occur. Rising fuel costs may require DOD to make difficult trade-offs, such as redirecting funds from ongoing programs to pay for needed fuel. In addition, both the Army and Marine Corps have plans to grow their forces over the next several years, which will inevitably require larger amounts of fuel to sustain these forces and their weapons systems.

Other energy issues that are likely to affect DOD in the future are the increased U.S. dependence on foreign oil, projected increases in the worldwide demand for oil, and uncertainties about world oil supplies. In 2007, about 67 percent of the oil consumed in the United States was imported, and the increased energy dependence on other countries raises concern about instability in the Middle East and elsewhere.<sup>5</sup> In addition, the Department of Energy projects that worldwide oil demand will continue to grow, reaching 118 million barrels per day in 2030, up from 84 million barrels per day in 2005. Although countries such as China and India will generate much of this increased demand, the United States will remain the world's largest oil consumer. Moreover, more than 60 percent of world oil reserves are in countries where relatively unstable political conditions could constrain oil exploration and production. Furthermore, worldwide

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<sup>5</sup>GAO, *Department of Energy: Oil and Natural Gas Research and Development Activities*, GAO-08-190R (Washington, D.C.: Nov. 6, 2007).

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supplies of oil from conventional sources remain uncertain. U.S. oil production peaked around 1970, and worldwide production could peak and begin to decline. Although there is great uncertainty about when this might happen, most studies estimate that oil production will peak sometime between now and 2040.<sup>6</sup> These issues, as well as the increasing threat of climate change, may lead to global instabilities that could require DOD to conduct operations in some of these regions and protect oil supply routes and critical infrastructure—all of which would ultimately lead to increased fuel requirements for the department.

In addition, DOD's high fuel requirements on the battlefield can place a significant logistics burden on military forces, limit the range and pace of operations, and add to mission risks. For example, for current operations, the fuel logistics infrastructure requires, among other things, long truck convoys that move fuel to forward-deployed locations while being exposed to potential enemy attacks. Combatant commanders may also face additional risks related to fuel disruptions in operations. For instance, according to a U.S. Central Command official, changes in customs procedures, truck driver strikes, refinery maintenance, road construction, and holiday periods may close border crossings for long periods of time, possibly resulting in the interruption of fuel supplies to forward-deployed locations. Moreover, a 2007 LMI report stated that the department's increasing fuel demand limits its ability to establish a more mobile and agile force.

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### DOD and the Military Services Have Made Efforts to Reduce Mobility Energy Demand

DOD and the military services have made efforts to reduce mobility energy demand for their forces and in their weapons systems. At the department level, OSD created the DOD Energy Security Task Force in 2006—consisting of an integrated product team, several working groups, and a senior steering group—to address long-term energy security concerns. Among other activities, the task force is monitoring the progress of selected military service-led research and development projects (see table 1) that have the potential for reducing mobility energy demand.

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<sup>6</sup>For a discussion of issues surrounding peak oil production, see GAO, *Crude Oil: Uncertainty about Future Oil Supply Makes It Important to Develop a Strategy for Addressing a Peak and Decline in Oil Production*, GAO-07-283 (Washington, D.C.: Feb. 23, 2007).

Table 1: Selected Energy-Related Research and Development Projects Being Monitored by DOD's Energy Security Task Force

Category	Project name	Description
Air platforms	Highly Efficient Embedded Turbine Engine	Develop a variable core engine to reduce fuel consumption in unmanned aerial vehicles, transport aircraft, and other aircraft.
	Small Heavy Fueled Engine	Extend the duration of unmanned aerial vehicle engines from 3-4 to 6-8 hours to increase fuel efficiency and reduce the logistics tail by using a single battlefield fuel; plan to apply to mobile ground power generators.
	Long-Range Unmanned Aerial Vehicles	Extend flight time of unmanned aerial vehicles for up to 6-7 days for increased fuel efficiency and savings over conventional surveillance and reconnaissance platforms.
Ground vehicles	Fuel-Efficient Ground Vehicle Demonstrator	Identify opportunities in fuel-efficient technologies to build a virtual vehicle that will demonstrate decreased fuel consumption in a tactical vehicle without decreasing performance or capability.
Power systems	Fuel Cell Research	Develop and demonstrate compact and mobile fuel cell systems to provide onboard power generation for increasing power demands and to reduce battery weight.
	Transportable Hybrid Electric Power Supply	Provide hybrid electric power generators to reduce diesel fuel usage and resupply requirements.
	Hybrid Intelligent Power	Automate generators on the battlefield to turn on and off as needed to minimize fuel use and reduce maintenance needs, personnel requirements, and power interruptions.

Source: DOD.

In addition to focusing on research and development initiatives, DOD has recognized a need to factor energy efficiency considerations into its acquisition process. In 2007, the Deputy Secretary of Defense included energy in DOD's list of the top 25 transformational priorities for the department as part of its initiative to pursue targeted acquisition reforms. Also in 2007, the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics established a DOD policy to include the fully burdened cost of fuel—that is, the total ownership cost of buying, moving, and protecting fuel in systems during combat—for the acquisition of all tactical systems that create a demand for energy.<sup>7</sup> To incorporate the fully burdened cost of energy into acquisition decisions, OSD initiated a pilot program that includes three systems: the Army and Marine Corps' Joint Light Tactical Vehicle, the Navy's new CG(X) cruiser, and the Air Force's Next-Generation Long-Range Strike aircraft.

<sup>7</sup>Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum, "Fully Burdened Cost of Fuel Pilot Program," April 10, 2007.

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In another initiative, the Joint Staff added language to its guidance in May 2007 requiring that an energy efficiency key performance parameter be selectively considered in the development of capability needs for new systems.<sup>8</sup> The guidance defines a key performance parameter as an attribute or characteristic of a system that is considered critical or essential to the development of an effective military capability.

In addition, each of the military services has its own initiatives under way to reduce mobility energy demand. The following highlights several key efforts and is not intended to be a comprehensive listing of all fuel reduction efforts.

**Army.** The Army is addressing fuel consumption at forward-deployed locations by developing foam-insulated tents and temporary dome structures that are more efficient to heat and cool and therefore could reduce the demand for fuel-powered generators at these locations. Another initiative is the development of a transportable hybrid electric power station, which uses wind, solar energy, a diesel generator, and storage batteries to provide reliable power with fewer fuel requirements.

**Navy.** The Navy has established an energy conservation program aimed at encouraging ships to reduce energy consumption. The energy conservation program provides training materials, such as a shipboard energy conservation manual and a pocket guide to assist commanders with energy-saving activities. The program also gives quarterly awards to ships that use less than the Navy's established baseline amount of fuel. The Navy has also made ship design alterations to reduce fuel demand.

**Air Force.** The Air Force has identified and begun to implement initiatives aimed at reducing mobility energy demand and increasing fuel efficiency, aligning these initiatives with its energy strategy. These initiatives include determining fuel-efficient flight routes, reducing the weight on aircraft, optimizing air refueling, and improving the efficiency of ground operations. In addition, it is testing synthetic fuels in its aircraft that could partly displace the use of petroleum-based fuel.

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<sup>8</sup>Joint Chiefs of Staff Instruction 3170.01F, *Joint Capabilities Integration and Development System* (May 1, 2007) and Joint Chiefs of Staff Manual 3170.01C, *Operation of the Joint Capabilities Integration and Development System* (May 1, 2007).

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**Marine Corps.** The Marine Corps has initiated efforts to develop alternative power sources and improve fuel management. For example, it is testing the use of hybrid power—by combining solar panel, generator, and battery energy sources—at remote sites to lessen its fuel transportation demands to forward-deployed locations. In addition, the Office of Naval Research is leading efforts for the Marine Corps to develop decision support tools that process and analyze data and improve fuel management in combat.

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**DOD Has Not Established an Overarching Organizational Framework to Guide and Oversee Mobility Energy Reduction Efforts**

While DOD and the military services have several efforts under way to reduce mobility energy demand, DOD has not established an overarching organizational framework to guide and oversee these efforts. In the absence of a framework for mobility energy, we also found that DOD has made limited progress in incorporating fuel efficiency considerations into its key business processes and in implementing recommendations from department-sponsored studies on fuel reduction. In the report that we issued today, we made recommendations that DOD establish an overarching organizational framework for mobility energy. Without such a framework, DOD cannot be assured that its current mobility energy reduction efforts will be fully implemented and will significantly reduce its reliance on petroleum-based fuel.

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**DOD Lacks Key Elements of an Overarching Organizational Framework**

Our prior work has shown that an overarching organizational framework is critical to successful transformation in both public and private organizations. The key elements of such a framework include (1) top-level leadership and an implementation team with dedicated resources and funding; (2) a comprehensive strategic plan, including goals and objectives, methods and timelines for evaluating progress, and outcome-oriented performance metrics; and (3) a communication strategy that involves creating shared expectations and reporting related progress.<sup>9</sup> We found that DOD's current approach to mobility energy lacks these elements.

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<sup>9</sup>GAO, *Results-Oriented Cultures: Implementation Steps to Assist Mergers and Organizational Transformations*, GAO-03-669 (Washington, D.C.: July 2, 2003), and *Agencies' Strategic Plans Under GPRA: Key Questions to Facilitate Congressional Review*, GAO/GGD-01.16 (Washington, D.C.: May 1997).

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**Top-Level Leadership and Implementation Team**

While DOD has begun to increase management attention and has identified energy as a transformational priority, it has not designated a single executive-level OSD official whose primary focus is on mobility energy and who is accountable for these matters across the department. Our prior work has stated that leadership must set the direction, pace, and tone and provide a clear, consistent rationale that brings everyone together behind a single mission.<sup>10</sup> Currently, DOD's approach to mobility energy is decentralized, with fuel oversight and management responsibilities diffused among several OSD and military service offices as well as working groups. DOD directives designate the Under Secretary of Defense for Acquisition, Technology, and Logistics as the department's senior energy official, with responsibility for establishing policies, granting waivers, and approving changes in the management of energy commodities, including petroleum.<sup>11</sup> However, it is unclear the extent to which the Under Secretary or any official from this office provides comprehensive guidance and oversight and sets a direction for mobility energy reduction efforts across the department. In addition, the Under Secretary has a broad range of other responsibilities that include, among other things, matters relating to the DOD acquisition system, research and development, systems engineering, logistics, installation management, and business management modernization. Therefore, the Under Secretary's primary focus has not been on the management of mobility energy.

In addition, DOD's Energy Security Task Force was formed to address long-term energy security concerns, such as DOD's reliance on fossil fuels, but we found that the task force has been unable to develop policy or provide guidance and oversight of mobility energy issues across the department. As indicated in its charter, the task force is required to develop a comprehensive DOD energy strategy and an implementation plan. Among other deliverables, the charter also requires it to define DOD's energy challenge, create a compendium of energy-related works, and perform a strategic assessment of energy. While the task force has taken steps to identify and monitor the progress of selected mobility energy reduction projects across the department, it has not yet completed an energy strategy or implementation plan, as well as other responsibilities. Furthermore, OSD officials told us that while the task

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<sup>10</sup>GAO-03-669.

<sup>11</sup>DOD Directive 4140.25, *DOD Management Policy for Energy Commodities and Related Services* (Apr. 12, 2004), and DOD Directive 5134.01, *Under Secretary of Defense for Acquisition, Technology, and Logistics* (Dec. 9, 2005).

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force has briefed the Deputy Secretary of Defense's advisory group on its recommended projects, it does not have a "seat at the table" in departmental discussions at the Deputy Secretary of Defense level or at other executive levels, such as the Joint Requirements Oversight Council, the Defense Acquisition Boards, or the 3-Star Group within DOD's Planning, Programming, Budgeting, and Execution process, as an advocate for reducing mobility energy demand.<sup>12</sup>

DOD also does not have an implementation team in place, with dedicated resources and funding, to address mobility energy issues. For example, the officials who lead DOD's Energy Security Task Force's integrated product team do so as an extra responsibility outside of their normal work duties. Other DOD officials said that the task force provides a good forum for sharing energy ideas across the department but lacks adequate staff to carry out specific actions. Furthermore, a task force participant told us that it can be difficult to find time to attend meetings while balancing other duties. The task force also does not receive any dedicated funding to pursue department-level energy priorities. Without a long-term funding mechanism, DOD may not be able to ensure that mobility energy reduction efforts receive sustained funding over a period of years.

Moreover, DOD may not be well positioned to serve as a focal point on mobility energy within the department, with Congress, and with the Department of Energy or other interagency partners. During a military energy security forum held at the National Defense University in November 2007, representatives from various DOD offices presented energy as an area that is significant to a breadth of issues ranging from force protection to global stability to the security of DOD's critical infrastructure. They also noted that DOD has the potential to play multiple roles with respect to energy, including consumer, market leader, educator/motivator, oil infrastructure protector, and warfighter supporter. These concerns, coupled with an increased national and congressional interest in reducing fossil fuel dependence and exploring alternative energies, will likely necessitate an increased leadership focus on long-term energy issues, both within DOD and in its role as a stakeholder in interagency and national dialogues.

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<sup>12</sup>The 3-Star Group within DOD's Planning, Programming, Budgeting, and Execution process includes members from OSD's Director of Program Analysis and Evaluation; OSD's under secretaries of defense; the Joint Staff Director for Structure, Resources, and Assessment; and the military services' 3-Star programmers. This group addresses major issues and presents decision options to the Secretary of Defense.



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Comprehensive Strategic Plan	DOD has not yet developed a comprehensive strategic plan for mobility energy, although it has taken some steps to lay the foundation for mobility energy strategic planning. According to OSD officials, DOD has begun to incorporate mobility energy issues into its <i>Guidance on the Development of the Force</i> , a department-level strategic planning document. In addition, the Office of the Deputy Assistant Secretary of Defense for Policy Planning, within the Office of the Under Secretary of Defense for Policy, is analyzing future energy concerns for the United States and the international security environment and highlighting their implications for the department. DOD officials said that the analysis is expected to provide information for consideration in the development of future strategic planning documents. We also observed that the DOD Energy Security Task Force has begun efforts to define goals that eventually may be incorporated into a DOD energy security strategic plan. OSD officials told us that the task force's intent is to complete this strategic plan by May 2008. However, current DOD strategic planning documents, such as the <i>National Military Strategy</i> and the most recent <i>Quadrennial Defense Review</i> , do not address mobility energy reduction. <sup>13</sup> Furthermore, until DOD fully develops and implements a comprehensive strategic plan for mobility energy, it cannot be certain that mobility energy reduction efforts align with the department's energy mission or strategic goals, ensure that they are appropriately prioritized, or know whether critical gaps or duplication of efforts exist.
Communication Strategy	DOD does not have an effective mechanism to facilitate communication and coordination of mobility energy reduction efforts among OSD and the military services. In addition, we found a lack of cross-service coordination concerning mobility energy reduction initiatives. While DOD's Energy Security Task Force aims to identify key players within the energy field, its current structure does not ensure departmentwide communication of fuel reduction efforts, particularly among the military services, which are responsible for most of these efforts. More specifically, during our observation of a task force monthly meeting, we found that although this venue provides for some sharing of information, the generally less than 2 hours allotted for each monthly meeting does not

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<sup>13</sup>The *National Military Strategy*, signed by the Chairman of the Joint Chiefs of Staff, is guided by the goals and objectives contained in the present *National Security Strategy* and serves to implement the Secretary of Defense's *National Defense Strategy*. The *Quadrennial Defense Review*, prepared by the Secretary of Defense every 4 years, assesses the nature and magnitude of the political, strategic, and military risks associated with executing the missions called for under the *National Defense Strategy*.

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allow for effective coverage of the spectrum of DOD's mobility energy issues. Moreover, we noted in our report that although the task force's senior steering group includes, among others, the service under secretaries and assistant secretaries; the Director, Defense Research and Engineering; and several principal deputy under secretaries of defense, it only meets two to three times a year. Additionally, with the exception of the Air Force, none of the other military service members on the senior steering group have primary responsibility for mobility energy efforts within their services. Without executive-level focal points, the military services may not be well positioned to effectively coordinate on mobility energy efforts across the department or provide leadership or accountability for efforts within their services. Furthermore, DOD cannot be assured that energy reduction efforts are consistent with DOD's energy priorities and goals.

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**DOD Has Made Limited Progress in Incorporating Fuel Efficiency into Key Business Processes and in Implementing Recommendations from Department-Sponsored Studies**

In the absence of an overarching organizational framework, DOD has made limited progress in incorporating fuel efficiency as a consideration in key business processes—which include developing requirements for and acquiring new weapons systems—and in implementing recommendations made in department-sponsored studies on fuel reduction.

**DOD Has Not Yet Fully Incorporated Fuel Efficiency Considerations into Its Key Business Processes**

While DOD has recently begun to take some steps to integrate fuel considerations into its key departmental business processes, such as its requirements development and acquisition processes for new weapons platforms and other mobile defense systems, these considerations are not factored in a systematic manner and cannot be fully applied. For example, DOD's requirements development process does not systematically include energy efficiency considerations, and the capability gap assessments associated with the process do not include fuel-related logistics, thus leaving these types of issues to be resolved after systems are fielded. In May 2007, the Joint Staff established an energy efficiency key performance parameter that would require fuel considerations during capabilities development. However, because DOD has not developed a methodology to determine how best to employ the energy efficiency key performance parameter, its implementation remains uncertain.

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DOD has also taken steps to inform its acquisition process with its pilot program to determine the fully burdened cost of fuel for three mobile defense systems. While the pilot program represents a step toward providing visibility over the total logistics costs associated with delivered fuel and DOD has set a fall 2008 deadline to issue guidance for applying the fully burdened cost of fuel in acquisition programs, DOD has not yet developed an approach for determining how it would incorporate this information into its acquisition decision-making process. Until the pilot program is completed and the results are assessed, DOD is not in a position to apply a fully burdened cost analysis to its acquisition process. Thus, the department is unable to promote greater visibility over its acquisition decisions or more fully consider the operational and cost consequences of the fuel burden on the logistics infrastructure.

Other key DOD business processes, such as those that address repair, recapitalization, and replacement of mobile defense systems, also present opportunities to incorporate fuel efficiency measures during system upgrades. However, OSD officials told us that the department generally makes decisions about system upgrades without regard to fuel efficiency, including the fully burdened cost of fuel, in part because such decisions require greater up-front costs. Although DOD recognizes that by reducing energy demand it can provide its forces greater flexibility and reduce their dependency on the logistics infrastructure, some OSD officials told us that DOD's budget process promotes a short-term outlook and does not encourage the purchase of fuel-efficient systems or upgrades that may initially cost more but could reduce life cycle and logistics costs over the long term. Moreover, the 2008 Defense Science Board report noted that DOD's lack of tools to assess the operational and economic benefits of fuel efficiency technologies is a major reason why DOD underinvests in the development and deployment of these technologies.

DOD Has Been Slow to  
Implement Recommendations  
from Department-Sponsored  
Studies on Fuel Reduction

In the absence of an overarching organizational framework, DOD has made limited progress in implementing recommendations from department-sponsored studies by organizations such as the Defense Science Board, The JASONs, and LMI that have urged an expansion of efforts to reduce dependency on petroleum-based fuel. These studies confirmed that for many reasons, continued heavy reliance on petroleum-based fuel poses a significant problem for DOD. For example, LMI reported that DOD's increasing fuel demand furthers the nation's reliance on foreign energy sources and, as we mentioned previously, limits the department's ability to establish a more mobile and agile force. The studies found a need to focus more DOD management attention on mobility energy matters and recommended actions aimed at, among other things,

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improving the fuel efficiency of weapons platforms, eliminating institutional barriers that bear upon the department's decisions regarding fuel efficiency, and developing a long-term mobility energy strategy that would lead to reduced consumption of petroleum-based fuel.

DOD has not taken a formal position on these recommendations, and implementation, in some cases, would require significant changes throughout the department that could generate institutional resistance. One study, for example, called for creating a unified energy governance structure in order to alter DOD's "energy culture." During our review, we found that DOD had taken some steps toward implementing some of the recommendations, such as initiating a pilot program for determining the fully burdened cost of delivered fuel and adding a requirement for a fuel efficiency key performance parameter in its Joint Staff policy manual. However, other recommendations, such as establishing a governance structure for mobility energy, have not been implemented. Furthermore, the 2008 Defense Science Board report noted that the recommendations made by the 2001 Defense Science Board report are still open and remain viable. Our report, which was issued today, presented the recommendations from these department-sponsored studies and actions DOD has taken in more detail. We also concluded that an overarching organizational framework could better position DOD to address these and other fuel reduction recommendations in a more timely and effective manner.

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**Overarching  
Organizational Framework  
Needed to Better Position  
DOD to Address Mobility  
Energy Challenges**

In the report we issued today, we recommended that DOD establish an overarching organizational framework for mobility energy to improve the department's ability to guide and oversee mobility energy reduction efforts.<sup>14</sup> To establish such a framework, DOD should designate an executive-level OSD official who is accountable for mobility energy matters; develop a comprehensive, departmentwide strategic plan; and improve DOD's business processes to incorporate energy efficiency considerations. In addition, we recommended that the military services designate executive-level focal points to establish effective communication and coordination among OSD and the military services on departmentwide mobility energy reduction efforts as well as to provide leadership and accountability over their own efforts. With a mobility energy overarching organizational framework in place, DOD would be

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<sup>14</sup>GAO-08-426.

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better positioned to reduce its significant reliance on petroleum-based fuel and to address the energy challenges of the 21st century. In commenting on a draft of our report, DOD partially concurred with our recommendations.

Mr. Chairman and Members of the Subcommittee, this concludes my prepared statement. I would be happy to answer any questions that you may have at this time.

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### Contact and Acknowledgments

For further information regarding this testimony, please contact William Solis at (202) 512-8365 or [solisw@gao.gov](mailto:solisw@gao.gov). In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals who made key contributions to this testimony are Thomas Gosling, Assistant Director; Karyn Angulo; Alissa Cxyz; and Marie Mak.

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**WITNESS RESPONSES TO QUESTIONS ASKED DURING  
THE HEARING**

MARCH 13, 2008

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## **RESPONSES TO QUESTIONS SUBMITTED BY MR. ORTIZ**

Mr. ARNY. The Energy Independence and Security Act (EISA) of 2007 comprises 16 titles, each covering a substantive area of energy policy. The sections of this Act regarding assignment of energy managers to each facility impacted by the Act, establishing a web-based tracking system, conducting audits on 25 percent of affected facilities annually, and the requirement to design facilities to reduce fossil fuel use by 55 percent in 2010, increasing to 100 percent by 2030 will cause implementation problems for DoD.

These issues are currently being discussed with the Department of Energy (DoE) to develop implementation guidance for federal agencies. The Department is concerned that initial DoE guidance would require a significant increase of personnel and funding resources that are not programmed and would not compete well against other DoD priorities. As such, we continue to discuss other means to achieve EISA requirements through the use of regional or pooling of assets. The Department does not believe legislative relief will be necessary, but if we do, we will seek the Congress's assistance.

DoD believes there are not sufficient energy efficiency measures to achieve the 55 percent and 100 percent targets for some building types (such as medical facilities, laboratories, and industrial facilities) mandated in EISA. This requirement will also be more challenging due to the loss of renewable tax credits. The loss of tax credits for renewable energy investment and production have already begun to hamper efforts to continue development of renewable resources. As part of its implementation planning, the Department will determine if legislation reauthorizing the tax credits should be included within our tool kit. [See page 14.]

Mr. DiPETTO. The decision whether nuclear power propulsion will be incorporated in future surface combatants will be based on a thorough examination in compliance with statute. The analysis of alternatives (AoA) for the Maritime Air and Missile Defense of Joint Forces (MAMDJF) capability, which includes an assessment of CG(X) alternatives, examines both fuel efficient conventional power plants and nuclear power alternatives. The Office of the Under Secretary of Defense (OUSD(AT&L)) is learning from the experience of the CG(X) as well as the Air Force Next Generation Long Range Strike program, and the Army-Marine Corps Joint Light Tactical Vehicle program, to develop methods and DoD guidance to more accurately factor operational fuel demand (and logistics force structure requirements) into the acquisition tradespace. This concept is called the Fully Burdened Cost of Fuel (FBCF), and joint planning estimates will be factored into all major programs in the future. This work will allow the Department to make more useful estimates for evaluating the fiscal cost of various propulsion options, hull forms, power requirements, construction materials, etc. The MAMDJF Analysis of Alternatives used a FBCF methodology in the analysis of alternative CG(X) power systems that addressed both conventionally fueled and nuclear options. The OUSD(AT&L) is reviewing the approach taken to inform the development of a Department-wide methodology that will be applicable to all types of systems and unit types. This FBCF construct will help the Department and industry to evaluate technological and design options to best manage the energy supply and energy demand options to best meet operational requirements and strategic sustainability requirements for future naval ships and other platforms. [See page 26.]

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## **RESPONSES TO QUESTIONS SUBMITTED BY MR. FORBES**

Mr. DiPETTO. The Defense Science Board task force reports, both in 2001 and 2008, discussed the need for DoD force planning models to play realistically the risks to missions resulting from the risk to fuel logistics and lines of communication in operations. They asserted that the DoD force planning process today tends to examine fuel and other "logistics" issues as a dependent variable, not as an independent variable, when using models and other such analytic tools. While it appears that some modifications would be necessary to examine this fuel logistics risk more realistically, that is relatively simple to do from a programming and design standpoint. However, models are only changed when there is a clear demand from higher

commands (typically Service staff force planners or warfighting commands), along with funding, for new modules to support new analyses. Hence, we have concentrated our work on developing an appreciation of this risk factor among those planners, such that the demand signal and resources flow to the modeling and analysis organizations within the Services. This work is on-going. The DoD Energy Security Strategic Plan, which is in draft, will include an annex with specific proposed tasks that will address the modeling issues related to analyzing DoD energy risks. [See page 15.]

Mr. ARNY. In a January 30, 2008, letter (attached), Senators Henry Waxman and Tom Davis requested information on how the Department was complying with this legislation. The Department's response (attached) to that request stated that a plan was being developed to identify which fuels are covered and what standards will be used to measure compliance. This plan is being developed in conjunction with the Environmental Protection Agency and other federal agencies. The Department can not make a rational judgment on the impact of the legislation until this plan is completed.

[The information referred to was not available at the time of printing.]

The Department is concerned that the provision could have far-reaching implications, including some forms of ethanol and bio-diesel, as well as synthetic fuels and petroleum derived from less traditional sources such as tar sands and oil-shale. Additionally, given that fuels, including conventional petroleum, are produced from numerous sources and often mixed together. Current standards for determining emissions of fuels from various origins are determined on averages. However, section 526 requires an analysis of individual fuel purchases for lifecycle greenhouse gas emissions. Therefore, determining the emissions footprint for any batch of fuel may be impossible. For example, conventional fuel derived from oil produced in Venezuela or Nigeria is more likely to have a larger footprint than domestic oil because of the energy used transporting the oil to the United States. Foreign and domestic oil may be mixed together at a refinery. Once foreign and domestic oils are mixed together, the oils cannot be differentiated from one another. Therefore, the footprint of the resulting fuel cannot be determined accurately under section 526.

Finally, Section 526 applies worldwide, not just to purchases within the United States. There are no means to determine the lifecycle greenhouse gas emissions from non-domestically produced fuels. For example, our military aircraft used over 6 million gallons of Canadian jet fuel in 2007 while exercising with the Canadian Armed Forces, conducting joint operations along the Defense Early Warning line, and refueling at Canadian commercial airports. Canadian fuels include fuel produced from tar sands crude. If tar sands-derived fuels were subject to section 526, our military aircraft may be required to stop refueling in Canada, potentially affecting our national security. [See page 16.]

#### RESPONSES TO QUESTIONS SUBMITTED BY MR. TAYLOR

Mr. ARNY. The Department of Defense, largely through the Office of the Secretary of Defense's (OSD's) Energy Security Task Force, the Army's Rapid Equipping Force and the Army Program Manager-Mobile Electric Power, is assessing a range of alternatives to reduce the operational energy demands of our deployed forces. A wide variety of technical and procedural solutions have been identified and are being fielded today. Initial efforts are focused on immediately executable, high return on investment and risk mitigation solutions. One of the most publicized solutions involves the introduction of spray foam-insulated tents. This initiative is providing a high return on investment while reducing risk to supply convoys and the force protection demands they drive. The Joint Contracting Command in Iraq just recently awarded a \$95 million competitive contract to insulate 9 million additional square feet of tents. It is projected that this work will reduce fuel demand in theater by 77,000 gallons a day, which translates to roughly thirteen to fifteen tanker trucks taken off the roads a day. When including the resulting reduced demand for force protection for those tankers, this effort will provide a significant operational capability benefit to commanders. While this is a positive step, more technically complicated or location-specific efforts are also being considered, to include the use of heat exchangers, as requests are received from the field or as they mature through traditional acquisition programs. Research and fielding of foam insulation, tactical micro-grids and heat exchangers are in planning. The Army currently has a heat co-generation Program of Record requirement in their budget starting in FY 2012. [See page 24.]

Mr. DiPETTO. The Department of Defense, largely through the Office of the Secretary of Defense's (OSD's) Energy Security Task Force, the Army's Rapid Equip-

ping Force and the Army Program Manager-Mobile Electric Power, is assessing a range of alternatives to reduce the operational energy demands of our deployed forces. A wide variety of technical and procedural solutions have been identified and are being fielded today. Initial efforts are focused on immediately executable, high return on investment and risk mitigation solutions. One of the most publicized solutions involves the introduction of spray foam-insulated tents. This initiative is providing a high return on investment while reducing risk to supply convoys and the force protection demands they drive. The Joint Contracting Command in Iraq just recently awarded a \$95 million competitive contract to insulate 9 million additional square feet of tents. It is projected that this work will reduce fuel demand in theater by 77,000 gallons a day, which translates to roughly thirteen to fifteen tanker trucks taken off the roads a day. When including the resulting reduced demand for force protection for those tankers, this effort will provide a significant operational capability benefit to commanders. While this is a positive step, more technically complicated or location-specific efforts are also being considered, to include the use of heat exchangers, as requests are received from the field or as they mature through traditional acquisition programs. Research and fielding of foam insulation, tactical micro-grids and heat exchangers are in planning. The Army currently has a heat co-generation Program of Record requirement in their budget starting in FY 2012. [See page 25.]

Mr. ARMY. The decision whether nuclear power propulsion will be incorporated in future surface combatants will be based on a thorough examination. The analysis of alternatives (AoA) for the Maritime Air and Missile Defense of Joint Forces (MAMDJF) capability, which included an assessment of CG(X) alternatives, examined both fuel efficient conventional power plants and nuclear power alternatives. The MAMDJF AoA used a Fully-Burdened Cost of Fuel methodology in the analysis of alternative CG(X) power systems.

Navy leadership is reviewing the AoA results. The Navy will select a Service preferred alternative for CG(X) and then provide a recommendation to the Office of Secretary of Defense at a Milestone A Defense Acquisition Board (DAB).

The Navy's FY 2006 Report to Congress on Alternative Propulsion Methods for Surface Combatants and Amphibious Warfare Ships indicated an upfront nuclear acquisition cost premium of \$600-\$700 million, in FY 2007 dollars, per ship for a medium surface combatant. This premium is over and above the acquisition cost of a fossil fueled ship. While the nuclear power variant includes a higher upfront acquisition cost than the fossil fuel variant, it should be offset over the life cycle by lower operations and support costs completely or to some degree depending on the ships' Operating Tempo, energy demands, and fuel prices. [See page 26.]



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**QUESTIONS SUBMITTED BY MEMBERS POST HEARING**

MARCH 13, 2008

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## QUESTIONS SUBMITTED BY MR. ORTIZ

Mr. ORTIZ. What is your assessment of the military value of domestic coal-to-liquid fuel production facilities that are being considered for construction on military installations such as Malmstrom Air Force Base? Please compare the relative military utility of domestic fuel production facilities with that of energy production technologies that can be used by warfighters outside CONUS. Where should the Department of Defense focus its efforts and resources to develop operational energy technologies?

General CARNS. The Department has developed a draft Energy Security Strategic Plan which provides the framework for focusing energy efforts across DoD. There are numerous projects ongoing that support our energy posture for platforms, and fixed and tactical installations. We are focusing efforts on a broad set of solutions to meet operational needs of the warfighters.

Within the draft Strategic Plan, Goal #2 is to "Increase energy security through strategic resilience by increasing the availability and use of alternative or assured energy sources." The Department's work on synthetic fuels, as well as on other technological energy solutions, is grounded in this goal.

DoD procures large volumes of military specification fuel for storage and distribution in support of the Department's mobility fuel requirements (i.e., ships and aircraft). Our goal is to be able to use fuel derived from any source or process with an emphasis on using assured sources where possible. Synthetic fuels, such as produced from coal to liquids, offer a promise of an assured fuel source, and we are focused on testing and certifying various fuels to ensure they can be used in our systems. Within the U.S., we are considering the use of domestically sourced synthetic fuel as an alternative to traditional petroleum, thereby reducing our dependence on non-assured sources of oil, with the desire of positively impacting the U.S. economy by initiating a domestic market for synthetic fuels and strengthening our energy security.

The Air Force is allowing private companies to use underutilized land to build various energy facilities, for which the Air Force would receive compensation, called an Enhanced Use Lease. Malmstrom is one such facility that could help the Department reduce its dependence on non-assured sources of oil.

Mr. ORTIZ. What role does DoD play relative to the Department of Energy in the development to alternative energies? How is DOD positioned to participate in national-level energy discussions with the Department of Energy and other agency partners? What needs to be done to cultivate these relationships?

Mr. DiPETTO. The Department of Defense and the Department of Energy (DOE) collaborate on numerous interagency efforts. The most formally established are the Interagency Working Group on Alternative Fuels and the Unconventional Fuels Task Force, which examine the feasibility of using various disparate feedstocks to create fuel that is capable of being used in conventional engines. We also collaborate in the monthly Energy Conversation, which meets with the goal of focusing on how energy issues impact programs and increasing visibility across the DoD, DOE and other Federal agencies. An "Energy Yellow Pages" is being developed throughout approximately 27 federal entities, to include DoD and DOE, that will enable partnerships across programs. We also are identifying specific programs where we may collaborate, such as the National Energy Technology Lab's work in algae-based fuels.

Mr. ORTIZ. What process does each military service follow to determine its priorities for funding alternative energies?

Mr. DiPETTO. Each Military Department has established or is establishing organizational processes for integrating energy efforts and issues. The Army Energy Security Task Force (AESTF) was recently stood up to develop the necessary strategic/action plans to satisfy emerging issues identified in Defense Science Board and Government Accountability Office (GAO) reports, Executive Order 13423, and other associated drivers. Additionally, the AESTF was charged with the development of a governance framework for all Army energy security efforts. The Navy is setting up a Navy Energy Task Force to provide a comprehensive Navy energy governance structure. For several years, the Air Force has had a well-defined structure, led by

the Assistant Secretary of the Air Force for Installations, Environment, and Logistics, with several technical panels underneath.

The Army's energy strategy is to create a culture of energy accountability, reduce energy consumption, and increase efficiency to enhance operational capabilities, increase the use of new/alternative energy sources, establish benchmarks, and champion investment strategies.

The Navy-Marine Corps investment strategy for alternative energy programs uses a number of criteria depending on the application and the maturity of the technology; however, the potential benefit versus cost criterion is always a factor. Investment criteria are tailored to assess the specific factors relevant to the evaluation and potential adoption or implementation of a specific technology. Technology investment criteria include factors such as the range of applicability (single versus multiple target application), operational need criticality (limited application range but critical to operational need), estimated cost of development, estimated non-recurring cost, and potential fossil fuel displacement.

The Air Force strategy is to minimize the use of tax-payer dollars to develop alternative energies. As a consumer we are working with private, alternative energy companies to provide alternative energy for our consumption. Using this strategy, we were able to accomplish the Nellis AFB solar project and we are attempting to duplicate this model at other bases.

Mr. ORTIZ. The Department of Defense and the military services independently fund numerous research and development projects for energy storage technologies such as fuel cells and batteries. What steps are being taken by DOD to coordinate the energy storage technology requirements and efforts of the services and to streamline investments?

Mr. DiPETTO. The Director of Defense Research and Engineering (DDR&E) initiated the Energy and Power Technology Initiative (EPTI) in 2002 as a Department-wide effort to explore and develop advanced capability-enabling power technologies. EPTI's mandate is to identify technical objectives, quantified technical barriers, and enabling technologies associated with development of advanced energy and power components and systems. There are five major focus areas: Power Generation, Electromechanical Conversion, Energy Storage, Thermal Transport and Control, and Power Control and Distribution. Each focus area has identified goals, objectives, challenges, approaches, and programs; and provides a macro view of priorities, descriptions of integrating demonstrations, and how they overlay onto specific component technologies.

EPTI is also engaged with the Interagency Advanced Power Group, which is a federal organization that facilitates exchange of information in Advanced Power, with specific emphasis on high-energy batteries, fuel cells, and other portable and mobile power sources.

Mr. ORTIZ. What is your assessment of the military value of domestic coal-to-liquid fuel production facilities that are being considered for construction on military installations such as Malmstrom Air Force Base? Please compare the relative military utility of domestic fuel production facilities with that of energy production technologies that can be used by warfighters outside CONUS. Where should the Department of Defense focus its efforts and resources to develop operational energy technologies?

Mr. DiPETTO. The Department has developed a draft Energy Security Strategic Plan which provides the framework for focusing energy efforts across DoD. There are numerous projects ongoing that support our energy posture for platforms, and fixed and tactical installations. We are focusing efforts on a broad set of solutions to meet operational needs of the warfighters.

Within the draft Strategic Plan, Goal #2 is to "Increase energy security through strategic resilience by increasing the availability and use of alternative or assured energy sources." The Department's work on synthetic fuels, as well as on other technological energy solutions, is grounded in this goal.

DoD procures large volumes of military specification fuel for storage and distribution in support of the Department's mobility fuel requirements (i.e., ships and aircraft). Our goal is to be able to use fuel derived from any source or process with an emphasis on using assured sources where possible. Synthetic fuels, such as produced from coal to liquids, offer a promise of an assured fuel source, and we are focused on testing and certifying various fuels to ensure they can be used in our systems. Within the U.S., we are considering the use of domestically sourced synthetic fuel as an alternative to traditional petroleum, thereby reducing our dependence on non-assured sources of oil, with the desire of positively impacting the U.S. economy by initiating a domestic market for synthetic fuels and strengthening our energy security.

The Air Force is allowing private companies to use underutilized land to build various energy facilities, for which the Air Force would receive compensation, called an Enhanced Use Lease. Malmstrom is one such facility that could help the Department reduce its dependence on non-assured sources of oil.

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#### QUESTIONS SUBMITTED BY MR. BARTLETT

Mr. BARTLETT. Do you agree with the DSB Task Force report's general finding, and specifically its classified appendix that lists critical missions performed at DoD installations and non-DoD facilities that are at risk of prolonged electricity outage due to the vulnerability of the national grid and inadequate on-site backup power? If so, please provide the HASC with an appropriately classified report or briefing with your plans or recommendations to ensure continuity of electricity for these missions.

Mr. ARNY. The Department is fully aware of the broad spectrum of vulnerabilities to the national power grid (and other U.S. infrastructure issues) that could impact DoD installations. DoD generally agrees with the findings of the Defense Science Board Task Force on Energy Security's Report. The Department, however, is not aware of an authoritative threat analysis or system assessment report describing the possibility of long-term power outages that could impact DoD installations and their missions.

Critical missions at DoD installations generally have adequate back-up power generation, and, in some cases, have uninterruptible power supplies to ensure national security is sustained in the event of short-term outages. These systems are tested to ensure they can carry the requisite loads and are constantly re-fueled to sustain operations for power outages that could last hours/days/weeks in length.

The potential hazards of a prolonged electricity outage necessitate a serious planning effort that continues to be developed, recognized, and exercised for preparedness in the Department of Energy, Department of Homeland Security, and DoD.

Mr. BARTLETT. Do you agree that requiring a plan to assess and prioritize critical missions at U.S. installations, incorporation of the concept of resilience in strategy and planning documents, identification of risk management options and identification of barriers outside the control of the department to implementing these options would reduce the risk from loss of power to within acceptable levels? If not, please provide the HASC recommendations for specific measures that would reduce the risk from loss of power to within acceptable levels?

Mr. ARNY. The Department agrees that a plan to identify missions, required capabilities, and critical assets is needed. We have worked diligently to establish a robust and disciplined approach to identify, prioritize, and assess the risk to those assets the Department deems critical to executing the National Defense Strategy. Such a plan would help the Department minimize the risk and manage consequences to within acceptable levels resulting from loss of power.

The Department released the Strategy for Defense Critical Infrastructure (DCI), which articulates the approach required for ensuring the availability of assets deemed essential to the successful completion of DoD missions in an all-threat and all-hazard environment. This strategy recognizes that although safeguarding the reliability of the nation's critical infrastructure will require a national effort, executing the strategy will provide defense stakeholders with a better understanding of what DoD must do to ensure the availability and resiliency of DCI.

Ownership of assets critical to the functioning of the DoD rests not only within the Department and other government agencies, but also throughout the private sector as well. The Department is cognizant of and accounts for the need to coordinate the assessment of risk and implementation of follow-on risk management activities with a myriad of organizations internal and external to the DoD, the Federal government, and private industry.

The Department recognizes Departmental equities must be addressed across the interagency in order to execute the National Defense Strategy and will use the framework established by the Department of Homeland Security (DHS) under the National Infrastructure Protection Plan to coordinate cross-sector, interdepartmental, and public-private requirements.

The Department also agrees that a detailed Energy strategy is needed, and efforts are underway to develop this strategy which we anticipate completion by the end of the year. Underpinning this strategy is the requirement and responsibility of the electric power industry to ensure resilient systems servicing critical loads, such as emergency services public sector as well as DoD installations supporting national security, are provided.

The Department, working with the Department of Energy (DOE), Federal Energy Regulatory Commission (FERC), and DHS can also help the electric sector understand the threat as well as structure appropriate war games to assess consequences management. The Department is also working with the Idaho National Laboratories on specific protection techniques for certain cyberattack modes. Finally, the Department is committed to implementing Section 433 of the Energy Independence and Security Act of 2007, specifically to ensure new DoD facilities have a net zero energy impact on the national grid by 2030.

Mr. BARTLETT. Do you agree that biomass, waste-to-power, geothermal power generation systems, bio-based ground transportation fuels, and other potential sources, such as nuclear, ocean thermal energy conversion (OTEC) and space-based solar power should be included in an update of the department's 2004 renewable energy assessment?

Mr. ARNY. Providing an update to the renewable energy assessment is no small endeavor. There are currently many renewable resource assessment tools available to installations in planning for energy security. The National Renewable Energy Lab (NREL) provides maps and charts identifying renewable resources throughout the country. DoD believes these tools should be used as the starting point for developing additional renewable energy. NREL can also provide a detailed analysis of the most cost-effective mix of energy sources for a particular location. Assessing needs on an installation-by-installation basis would be a more cost-effective method than a whole scale update of the previous study.

Mr. BARTLETT. To what extent can renewable resources be used to meet the demands of critical mission loads?

Mr. ARNY. When compared to the Nation-at-large, a considerable portion of the Department's energy needs are met by renewable energy resources. In Fiscal Year 2007, the Department produced or procured renewable energy equivalent to 11.9 percent of electrical consumption and that value will rise in the future. Considering the cost of redundant infrastructure for reliability, critical missions are sometimes not located in close proximity to life-cycle cost-effective renewable energy sources, thereby making it a challenge to focus renewable resources to meet the demands of critical mission loads. The Department is committed to providing the appropriate level of energy security for all missions, including critical missions, and will continue to evaluate renewable resource availability and economic feasibility to accomplish our missions.

Mr. BARTLETT. Do you agree with the DSB Task Force report's recommendations to "island" critical classified missions and installations from the grid when necessary?

Mr. ARNY. In general, I agree with the concept of having the ability to "island" critical infrastructure from the grid when necessary. This capability must be built over time and one step toward this capability is compliance with Section 433 of the Energy Independence and Security Act of 2007, which essentially requires Net Zero buildings for the future. The Department is also developing a Net Zero Energy Installation planning guide, which will help ensure entire installations, not just specific buildings, have "islanding" capabilities. Still, we must be careful in developing these plans to ensure that installations do not become islands unto themselves while surrounding communities suffer in darkness. We believe it is at least as important to solve vulnerability issues on the national level as it is to have "islanding" capabilities.

Mr. BARTLETT. Do you agree that a cross-agency and department and intergovernmental working group is necessary in order to "island" critical classified missions and installations from the grid when necessary? Would Presidential Leadership and authority be necessary to support implementation of islanding of critical classified missions and installation from the grid when necessary?

Mr. ARNY. HSPD-7 (Critical Infrastructure Identification, Prioritization and Protection) already directs the Department to work with other Federal departments and agencies to "prevent, deter, and mitigate the effects of deliberate efforts to destroy, incapacitate, or exploit" critical infrastructure and key resources. The National Infrastructure Protection Plan (2006) provides the framework for addressing the entire national effort to execute coherent identification, prioritization, and protection activities, across all critical sectors, levels of government, and among private and public entities.

Additionally, a committee of the National Science and Technology Council recently recommended that a subcommittee be established to examine the Science & Technology issues/opportunities associated with this issue. DoD, along with the Department of Energy, Department of Homeland Security, Federal Energy Regulatory Commission, Environmental Protection Agency and other agencies will be engaged in this new effort.

Internally, the Department is working to identify critical infrastructure and ensure a capability to sustain military missions, under the auspices of the Energy Security Task Force. Due to the intensity of ongoing efforts, we do not feel additional authority is necessary to accomplish the Department's goals.

Mr. BARTLETT. Would the inclusion of energy demand, energy logistics, energy protection requirements, and endurance of combat forces into any models, simulations, and wargames and all other analytical tools be used by the department improve the ability of the department to calculate the fully burdened cost of fuel?

Mr. DiPETTO. The purpose of the "fully burdened cost of fuel" is to include a quantitative, financial value within the acquisition tradespace to represent the logistics and force protection effort it will take to ensure delivery of the needed volume of fuel to an operational system. To develop a defensible number that will aid decision-making between cost, schedule and performance trades, the Department must consider all of those fuel delivery forces, and their protection, employed within a given set of operational and non-operational (e.g. training) scenarios. This is a natural extension of the DoD scenario-based force planning and requirements generation processes.

Hence, to do this work, a variety of fuel-related factors need to be actively played in models, simulations, wargames and in the Defense Planning Scenarios. The findings from these activities must then be carried into the requirements development process, similar to variables concerning lethality, survivability and maintainability, among others. The weighting of these capability variables against each other, to include energy demand, will be reflected in the Joint Requirements Oversight Council (JROC)-validated capability direction for the force, and potentially, the Key Performance Parameters chosen to guide the development of individual systems and acquisition platforms.

The Department has begun to play these energy delivery risk variables in a major Air Force wargame and in several Defense Planning Scenario-related sessions (with interagency involvement). This preliminary work is focused on building an appreciation of fuel as an operational risk factor. Along with other guidance, this will lead to the modification of key models, and to the analysis they support, to treat fuel-related risks much like other capability variables.

The Office of the Under Secretary of Defense (Acquisition, Technology and Logistics) is leading the development of a DoD Energy Security Strategic Plan, as well as changes to key Directives and guidance documents, to ensure these variables are considered appropriately when designing and developing our future forces. This work will directly inform how the "fully burdened cost of fuel" is determined and applied for each acquisition system.

Mr. BARTLETT. Has the integration of energy demand, energy logistics, energy protection requirements, and endurance of combat forces into any models, simulations, wargames, and any other analytical tools be used by the department been mandated under the April 2007 USD(AT&L) memorandum requiring the inclusion of the fully burdened cost of fuel for all acquisition trade analyses?

Mr. DiPETTO. As directed in the April 2007 memorandum from the Under Secretary of Defense (Acquisition, Technology and Logistics), the Department reviewed three acquisition programs to understand how fuel risk variables were considered in their cost, schedule and performance tradespace. The lessons learned here, along with the assessment of the Defense Science Board Task Force on Energy Security in 2008, are being used to write guidance for the acquisition community on how and when to consider the fully burdened cost of fuel (FBCF) in the course of a Major Defense Acquisition Program. Both DoD Directive 5000.02 and the Defense Acquisition Guidebook are being revised this year to incorporate these guidance changes.

The integration of the energy variables will be addressed in the DoD Energy Security Strategic Plan. The Strategic Plan is currently in review by DoD senior leadership. Therefore, it is premature to comment.

Mr. BARTLETT. Has the fully burdened cost of fuel been included as a factor in any models and simulations used in DoD's Analytical Baseline and vignettes used as the basis for Analyses of Alternatives (AoA) and Evaluation of Alternatives studies since the issuance of the April 2007 USD (AT&L) memorandum requiring the inclusion of the fully burdened cost of fuel acquisition trade analyses?

Mr. DiPETTO. The Fully Burdened Cost of Fuel (FBCF) is a newly devised factor for inclusion in DoD life-cycle cost estimating, specifically for use in deciding between alternative designs and technologies in the acquisition and science & technology investment areas. Because FBCF is only an estimation of financial cost, it does not inform DoD processes that evaluate capabilities gaps, such as the modeling, simulations, wargames, and scenario-based planning that go on in the DoD Joint Strategic Planning Process (which includes the Defense Planning Scenarios and the Analytic Agenda).

Rather, FBCF is informed by the scenario-based force planning analysis work. This analysis helps determine how much fuel is required as well as the types and scale of fuel logistics forces that are required, to execute notional future operations. The predicted costs of the fuel and fuel logistics forces are then added up and are attributed proportionally to the alternative platform designs to generate the FBCF.

Analyses of Alternatives or Evaluations of Alternatives (AoA/EoA) are performed at the juncture of the DoD requirements process, Joint Capabilities Integration and Development System (JCIDS), and the acquisition process to help determine how the Department will fill an identified future capability gap with a materiel (equipment) solution. The AoA/EoA is unique because it is the only point in the decision process where both the capability of the alternative systems and their respective costs are explicitly varied and compared as core decision factors.

To date, no AoA/EoA has included a calculation of the Fully Burdened Cost of Fuel. This is because the Department is still working on an agreed methodology for how such cost estimates are to be developed. The Office of Under Secretary of Defense (AT&L) is collaborating with a variety of DoD organizations to develop this base methodology and the rules for how the Components must apply it. Great care is being taken to ensure the first application of the approach is methodologically sound, and that fuel-related variables carry an appropriate, not disproportionate, weight in the tradespace related to capability and affordability.

Mr. BARTLETT. Will the department please provide the HASC information about any analyses and the outcome of those analyses that have incorporated the fully burdened cost of fuel?

Mr. DiPETTO. In April 2007, the Under Secretary of Defense (Acquisition, Technology and Logistics) issued a policy memo directing the use of the fully burdened cost of fuel (FBCF) concept in the DoD acquisition process. To implement the FBCF, the AT&L policy memo called for the initiation of a pilot program to develop the best business practices to incorporate FBCF into DoD Acquisition. To date, the pilot program is nearing conclusion and lessons learned are only now being formally incorporated into DoD Acquisition instructions and guidance. Consequently, as analyses are completed in response to formal instruction and guidance requirements, the Department will provide the House Armed Services Committee information as requested.

Mr. BARTLETT. Would the inclusion of an energy efficiency Key Performance Parameter (KPP) as required by the Chairman of the Joint Chiefs of Staff Instruction CJCSI3170F dated May 2007 improve the department's ability to manage energy use and costs in acquisition trade analyses?

Mr. DiPETTO. CJCSI 3170.01F outlines the policies and procedures of the DoD Joint Capabilities Integration and Development System (JCIDS), which is the Department's process to validate and prioritize war fighting requirements. Within JCIDS, KPPs serve to define those system attributes or characteristics that are deemed critical to fill an identified capability gap with a materiel (equipment) solution.

Inclusion of an energy efficiency KPP could improve the Department's ability to manage energy and fuel-related costs, if it is underpinned by a flexible analytical methodology that can be applied to the full range of air, ground and maritime environments. However, the analytical tools and supporting methodology to make comparisons and to set targets and minimum thresholds have yet to be developed. Some of this methodological work has been initiated by the acquisition community for the purpose of calculating the Fully Burdened Cost of Fuel. Once the methodology is agreed to, and the modeling tools are developed and applied by the force planning community, the KPP would inform the acquirers of how the fuel demand of the system and the size of the fuel delivery force structure it will require should be addressed against other performance and cost factors.

Mr. BARTLETT. What other measures would improve the department's ability to manage energy use and costs?

Mr. DiPETTO. The Department is finalizing an over-arching Energy Security Strategic Plan that will provide a framework for understanding and addressing energy challenges at all levels and activities across the Department. The strategic plan identifies four goals and prescribes actionable tasks for the Department to pursue in addressing these challenges, thereby enhancing our energy security posture. The strategic goals are:

1. Maintain or enhance operational effectiveness while reducing total force energy demands → REDUCE DEMAND
2. Increase energy security through strategic resilience (e.g. alternatives/renewables and reducing dependence on non-assured sources) → ASSURE SUPPLY

3. Enhance operational and business effectiveness by institutionalizing energy solutions in DoD planning and business processes → IMPROVE PROCESSES
4. Establish and monitor Department-wide metrics → IMPROVE PROCESSES

The strategic plan is currently in coordination within the Department with an anticipated release later this year.

We have also initiated several demonstrations and other projects to reduce energy consumption and increase alternatives for installations, both fixed and tactical, and platforms, with anticipated savings ranging from 5% to 25%. Together, these efforts will reduce costs and enable sustained, uninterrupted operations for the Department. Efforts at tactical installations will have the additional effect of reducing fuel convoys, thereby putting fewer soldiers, sailors, airmen and marines in harms way.

Mr. BARTLETT. Would mandating the inclusion of energy demand, energy logistics, energy protection requirements, and endurance of combat forces into any models, simulations, wargames, and tactical exercises or other planning tools used by the department and the services provide more accurate calculations of the fully burdened cost of fuel (FBCF)? If not, what measures would improve the accuracy of calculations of the fully burdened cost of fuel?

General CARNS. Yes, the inclusion of energy demand, energy logistics, energy protection requirements, and endurance of combat forces models, simulations, wargames, and tactical exercises or other planning tools used by the department and the services would allow for a more accurate calculation of the fully burdened cost of fuel (FBCF). Accordingly, the Task Force recommended that DoD accelerate the following three tasks:

1. Build fuel logistics into campaign analyses and other analytical models and simulations to inform the requirements process of the operational, force structure and cost consequences of varying battlespace fuel demand;
2. Establish outcome-based energy Key Performance Parameters (KPPs); and
3. Use FBCF as a factor in all Analyses of Alternatives/Evaluation of Alternatives (EoAs) and throughout all acquisition trades.<sup>1</sup>

DSB Energy Strategy Task Force found that current modeling and simulation conducted during Joint Capability Integration and Development System (JCIDS) and the Service pre-JCIDS planning functions lack the capability to quantify the contribution of system efficiency to battlespace outcome or force structure requirements. Force-on-force models and simulations used to explore new concepts and test new systems do not explicitly include logistics; this is a serious shortcoming. The Task Force recognizes that the models make simplifying assumptions for the sake of looking at battlefield effects and outcomes under certain constraints and limitations, but it strongly recommends that analysts not turn a blind eye to the need to account for logistics in the capability documents. Lessons learned and military judgment sometimes get applied as sanity checks and programmatic goals, but in the absence of explicit modeling it becomes easy to minimize what is inherently inconvenient. Such explicit modeling of logistics assets would better reflect reality, and would have significant impacts on concepts and the way required capabilities are developed.

If the requirements process does not understand energy efficiency in terms it values—operational capability, combat vulnerability, and force structure balance—it will have no reason for making efficiency a requirement. If the acquisition process does not understand the total ownership cost of buying, moving and protecting fuel to systems in combat (fully burdened cost of fuel), then its business case analyses will use only the commodity price for fuel. This distorts the results to make high return investments in efficiency look much worse than they really are.<sup>2</sup>

Mr. BARTLETT. Would mandating the inclusion of energy demand, energy logistics, energy protection requirements, and endurance of combat forces into any models, simulations, wargames, and tactical exercises or other planning tools used by the department and the services provide more accurate calculations of the fully burdened cost of fuel (FBCF)? If not, what measures would improve the accuracy of calculations of the fully burdened cost of fuel?

General CARNS. Yes, the inclusion of energy demand, energy logistics, energy protection requirements, and endurance of combat forces models, simulations, wargames, and tactical exercises or other planning tools used by the department and the services would allow for a more accurate calculation of the fully burdened

<sup>1</sup> <http://www.acq.osd.mil/dsb/reports/2008-02-ESTF.pdf>; Page 5

<sup>2</sup> <http://www.acq.osd.mil/dsb/reports/2008-02-ESTF.pdf>; Pages 26–27

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Mr. BARTLETT. Do you agree that a cross-agency and department and intergovernmental working group will be necessary in order to implement “islanding” of critical classified missions and installations from the grid when necessary? Furthermore, would Presidential leadership and authority be necessary to support implementation of islanding of critical classified missions and installations from the grid when necessary?

General CARNS. Yes, DSB Energy Strategy Task Force recommends that DoD collaborate closely in these endeavors with other agencies, especially the Department of Energy (DoE) and its national laboratories, whose mission is energy research and technology deployment. DoE national laboratories have historical energy advisory relationships with the Services that can accelerate results. Completely isolating all installations from the grid is not practical, and islanding with distributed generation of local electricity sources can mitigate the risks.

DoDI 1470.11 §5.2.3 states it is DoD policy to use onsite, self-contained power for critical functions, DoD-facilities-based microgrids, and netted area microgrids for extended strategic islanding, coupled with end-use energy efficiency measures. The Renewable Electricity Purchasing and On-Base Development Plan developed in 2004 by the Renewables Assessment Working Group was designed to quickly improve energy reliability and security at installations by working in deregulated states where no utility cooperation is required to make them less vulnerable through islanding, as recommended by the National Research Council. Thus, policy and plans are in place to move towards islanding for critical mission purposes. However, the Task Force could find no evidence that DoD has taken tangible steps to implement this policy or plans beyond a very small number of high profile projects. This is so, even though renewable energy sources such as solar, wind and geothermal are often economically advantageous and resilient, reducing the risk of mission interruption. Buying renewable energy credits, while an admirable step toward reducing carbon footprint, accomplishes nothing toward mitigating risks from power loss to critical missions.

At specific locations where remedies within DoD’s ability to implement are not technically or economically feasible, it may be necessary to engage local utility companies, regulatory agencies, and possibly State governments or the Congress to improve the reliability of the grid. In principal this might be done through regulatory

<sup>3</sup> <http://www.acq.osd.mil/dsb/reports/2008-02-ESTF.pdf>; Page 5

<sup>4</sup> <http://www.acq.osd.mil/dsb/reports/2008-02-ESTF.pdf>; Pages 26–27



or legislative action. However, it would require building redundancy at key nodes, redundant substations or buying spare equipment. Where DoD is the sole requesting party, it will probably have to fund these improvements.

“Decoupling” is a recent regulatory trend enacted in a number of states that has the potential to reduce stress on the grid. Historically, utility regulators have set electric and gas rates based on projected sales volume. Since this also sets a utility’s revenues, it is a disincentive for them to promote efficiency or to make it easy for customers to install on-site generation. “Decoupling” breaks the linkage between the amount of electricity or gas a utility sells and its ability to generate profits. This approach has the potential to enable utilities to remain profitable while investing in improved efficiency and reliability. Some states let utilities keep a small part of what they save for their customers as extra profit. This fully aligns utilities with customers’ incentives and can strongly motivate utilities to help customers use electricity more efficiently. DoD may wish to include supporting such legislation as a possible approach to reducing risk at high-risk locations.<sup>5</sup>

Mr. BARTLETT. Please make specific recommendations to HASC concerning changes in the organization and composition of personnel within the services and the department that would improve the management of energy demand by operational forces.

General CARNS. Defense Science Board (DSB) Task Force on DoD Energy Strategy<sup>6</sup> recommended that DoD establish a Department-wide strategic plan that establishes measurable goals, achieves the business process changes recommended by the 2001 DSB report<sup>7</sup> and establishes clear responsibility and accountability. Currently, energy demand is an unplanned consequence of poorly informed decisions. Analytical tools are needed to develop meaningful and achievable energy goals, and business process changes are needed to enable new information to be considered when making key decisions that affect energy use. Success will require a plan that is horizontally and vertically integrated throughout the Department, with participation by all functional areas that make decisions affecting energy use with sustained oversight at the Deputy Secretary of Defense level.

Specifically, the Task Force recommended:

1. By June 2008, establish a senior energy official responsible for development of policies and procedures and oversight of their implementation. This official should have a voice at the key decision bodies throughout the requirements, acquisition, and funding processes to ensure energy considerations have been accurately factored into key decisions that affect DoD’s energy demand patterns and risks from disruptions in commercial energy supplies.
2. By June 2008, USD(P) incorporate the concepts of resilience and endurance of combat forces as tactically and strategically important metrics to be included in future strategy and planning documents. While the names of these documents change frequently (e.g., Quadrennial Defense Review, National Military Strategy, Strategic Planning Guidance (being renamed Guidance for Development of the Force/Guidance for Employment of the Force)), these concepts should guide the formulation of Department goals and strategy for managing energy.
3. By July 2008, USD(AT&L) direct the establishment of partnerships with the Director, Defense Research and Engineering (DDR&E) and Department of Energy office of Energy Efficiency and Renewable Energy (DoE/EERE) to identify technologies with the potential to contribute to endurance metrics by reducing battlespace fuel demand by deployed forces and at forward operating bases.
4. By October 2008, develop and implement a Department-wide plan to integrate energy into appropriate education and training programs, to include professional military education, to include Senior Service Schools, Capstone and Apex; and specialty-specific education, such as acquisition corps and engineering. Curricula should include risk to mission, cost and force structure aspects of energy as addressed in this report and appropriate to the course.<sup>8</sup>



<sup>5</sup> <http://www.acq.osd.mil/dsb/reports/2008-02-ESTF.pdf>; Pages 59–60

<sup>6</sup> <http://www.acq.osd.mil/dsb/reports/2008-02-ESTF.pdf>

<sup>7</sup> <http://www.acq.osd.mil/dsb/reports/fuel.pdf>

<sup>8</sup> 2008 DSB Energy Strategy Task Force Report, Recommendation 3, pages 68–69